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Event and Comment.

The Current Issue.

Readers should find the current Journal a most interesting one. Foremost among the special articles is the first of a series on agricultural organisation, covering an account of American co-operative associations and a comparison of them with the Queensland Producers' Association, written from on-the-spot studies by Mr. J. D. Story, who visited California recently on behalf of the Queensland Government. Cotton-growing is served with comprehensive and seasonable matter. As our greatest agricultural interest sugar is, as usual, well covered. Mr. Easterby contributes a timely comment on the industry, and Mr. Edmund Jarvis's science notes are particularly interesting. The first instalment of a special series on fertilisers and manures is very informative, and is designed as a source of material for a course of lectures to farmers to be inaugurated shortly. A review of a year's activities in the Stock Division and the Pure Seeds and Stock Foods Section throws a strong light on the doings of industrious and little-advertised branches of the Department. "Stud Stock Studies" is a new illustrated feature designed to present pictorially types of leading dairy cattle breeds with the object of, in a measure, stimulating and maintaining interest in dairy herd improvement. Illustrated notes on Queensland trees and weeds are also, among numerous other matters, of current importance.

Economic Education and Commonsense Co-operation.

Agriculture is the first industry in the State—as a fact, it is the first industry of any country—and its prosperity has the greatest direct and indirect influence upon conditions affecting the national welfare. It is the industry that deals with the most valuable, the most lasting, and at the same time the most elastic of our material resources—the fertility of the soil. It is the industry that naturally appeals to all of us, for most of our national traditions are rooted in the soil. And yet in spite of its strong appeal to natural industrial instincts, and its strong hold upon the traditional imagination of the people it is so sorely beset with difficulties that land settlement has grown into a problem, and the retention of pioneer settlers on their holdings a problem just as great. The economic weakness of the agricultural industry is one of the great causes of urban congestion and rural declension. What the industry insistently calls for is the marking and traversing of the right economic path, fresh application of science, bolder initiative, and effective education —the sort of education that gives not only technical knowledge, but the mental equipment that enables men to respond with a quick intelligence when new ideas of value are placed before them, and to reject those that are merely plausible; the sort of education that gives a greater insight into the economic forces that affect

their industry, the delicacy and intricacy of modern commercial machinery, and a broader outlook over the field of industrial opportunity. True co-operation as applied to the agricultural industry has never yet been properly tried out; it has never yet really had an open chance. There have, it is true, been many significant individual successes—successes, however, balanced by some significant failures. The great desideratum is State-wide commonsense co-operation on broad plain ordinary horse-sense lines, and in the Queensland Producers' Association Queensland farmers have now a lever for, and a great opportunity of, placing their industry in the position of natural and national pre-eminence that it should rightly occupy.

The Sugar Industry.

One of the outstanding events of the month was the visit of the Queensland Sugar Delegation to Melbourne to place before the Prime Minister the facts affecting the contemplated alteration of conditions governing the economic side of the sugar industry. The Minister for Agriculture and Stock (Hon. W. N. Gillies) led the delegation and pressed for a renewal of the Federal agreement under which the industry had become to a large extent stabilised. His task was a difficult one for Southern hostile influence, based on ignorance of facts, failure to outgrow erroneous opinions formed and policies advocated in pre-Federal days, and Press prejudice sedulously cultivated, opposed bitterly the continuance of the present sugar agreement. Mr. Gillies expressed surprise that there are Australians to-day who have not yet realised that the doctrine of "White Australia" has passed from an ideal to an actuality through the agency of the Queensland sugar industry, that both the kanaka and large plantations have long since disappeared, and that in their stead are small farms owned and worked almost exclusively by men of their own colour, race, and ideals. The industry to-day, re-emphasised Mr. Gillies, had become the greatest bulwark of our national safety. Australia is the one country in the world to-day that grows sugar-cane successfully and manufactures it into sugar by white labour and under white labour conditions. Queensland has hundreds of thousands of acres of land with a climate and rainfall suitable for sugar-growing equal to that in any part of the world. Other points in favour of renewal of the agreement or adoption of the submitted tariff alternative were stressed strongly by other members of the delegation, who represented directly every section of the sugar industry. The Prime Minister, in the course of his reply, said that the Federal Government realised fully the value of the industry both economically and nationally; he held out no hope for the renewal of the agreement, but promised that the industry would be safeguarded fiscally.

Fighting Drought.

The Council of Agriculture has submitted to the Government a comprehensive scheme of fodder conservation with a view to the preservation of dairy herds during prolonged dry spells. The scheme is regarded as the overture in a complete anti-drought campaign designed to protect all agricultural and pastoral activities in lean years.

Central Dumps Favoured.

The Council is of opinion that storage of baled lucerne hay and the production of ensilage will be found to be satisfactory methods of fodder conservation. Provision for the latter would have to be made on farmers' holdings, while in the matter of storage of lucerne hay the Council is of opinion that it would be necessary to provide for central storage dumps at railway sidings and other central points to provide for important settlements located some distance from railway lines. Although lucerne hay can be held with much greater safety than some other fodders, and is indeed good security for an advance, it might also be found practicable to conserve other fodder such as wheaten or oaten chaff in bulk, cereals, and so on, and in any Act of Parliament establishing the scheme, power should be given to the controlling body to undertake such conservation, if deemed advisable. While the Council strongly favours the storage by farmers of reserves of hay on their own holdings, it advises against embracing within a comprehensive fodder conservation scheme any provisions covering the storage of hay on farms. It is felt that the matter of advances to encourage the storage of hay on farms is the proper sphere of private financial institutions, or of a rural credit system if established. Even for such bodies as these, the security for advances specifically to enable farmers to hold hay on farms would not be a good one, and inspection to ascertain the quantity on which the advance should be made, and to provide for adequate protection of the security, would be extremely costly.

The Question of Finance.

The Council has considered four methods of financing the scheme, namely:—

(*a*) Power to the controlling body to issue bonds (or debentures) to the public.

(*b*) A fodder pool to be constituted, the producers retaining an interest in the fodder getting a small advance at time of delivery and participating in final distribution.

(*c*) Offer of debentures for sale to producers likely to use fodder with or without Government subsidy.

(*d*) Capitalisation of fodder conservation scheme by the Government or of loan funds.

The Council is of opinion that the method under (*b*) above is not advsiable. This is further commented upon in clause 15 hereof.

Method under (*c*) is deemed entirely impracticable.

The Council favours the methods under (*a*) and (*d*).

The total finance required to carry out a scheme of the magnitude herein suggested would probably reach the figure of 3½ million pounds sterling. This would not all be required at the outset, but should be gradually made available as storage proceeds. Probably an average of £700,000 per annum for the first five years would enable the objective to be attained. This may at first sight seem an inordinately large expenditure, but when regard is had to the immense losses entailed by calamitous droughts, it is believed that even opponents of such a scheme cannot but concede the proposals to be a sound business proposition.

Strictly Cash Basis.

It is strongly urged that no fodder should be sold except for cash. If relief be essential in necessitous cases under drought conditions, the private financial institutions, State Advances Corporation, or a system of rural credit should place the farmer in a position to purchase fodder from the Fodder Conservation Board for cash. If any other system be followed, there would be a tendency for the Fodder Conservation Board to find its capital locked up in debts due by sundry debtors, thereby making it impossible for the board to repurchase stocks following upon depletion. If care be not exercised there is a danger of the Fodder Conservation Board becoming an ordinary banking institution, and the essential of fodder conservation would tend to be lost sight of.

Suggested Conservation Board.

The Council recommends that the business of fodder conservation be undertaken by a body to be designated the Fodder Conservation Board, and that the capital provided be vested in the board as trustees of the fund. A special Act of Parliament would be necessary governing the operations of the scheme. The Council recommend that all members of this board be appointed by the Government and suggests that in the constitution of such boards provision be made for not fewer than two out of five or three out of seven being *bonâ fide* primary producers.

It is recommended that all matters affecting advances for the purpose of building silos on farms be transferred from Government Departments at present undertaking that service to the Fodder Conservation Board, as the latter body would be concentrating upon all aspects of fodder conservation.

The Council is of opinion that at the inception of the scheme hay for storage should be purchased straight out by the Fodder Conservation Board. It is of opinion that the retention by the deliverer of the hay of any interest in the hay delivered is not advisable. The price paid should be such as to remunerate the producer, and to enable the Fodder Conservation Board to become sole owner of the fodder they control.

Question of Mortgages.

It is pointed out that many farms, on which silos should be constructed, are already mortgaged to banks, private institutions, or to the State Advances Corporation, and some difficulty attaches to the matter of providing good security. This, it is thought, however, may be afforded by one of the following methods, namely:—

(*a*) Legislative enactment, providing that advances for silos shall have priority over all other encumbrances.

(*b*) Enactment, providing that the land on which silos are constructed, with right of access, shall be transferred to the Fodder Conservation Board.

(*c*) Equal rights in *pari passu*, with existing mortgage, or

(*d*) Second mortgage.

The method under item (*c*) is favoured by the Council, on the ground that the institution of a fodder conservation scheme would extensively buttress the security of existing mortgagees, and as the amounts advanced for silos would not be large, existing securities would be improved rather than prejudiced.

ORGANISATION OF THE AGRICULTURAL INDUSTRY IN QUEENSLAND—I.

By J. D. STORY, Chairman Administrative Committee, Council of Agriculture, and J. F. F. REID, Editor of Publications, Department of Agriculture and Stock.

This is the first of a series of articles, prepared especially for the Journal, crystallising the results of investigations and studies of Californian methods of Agricultural Organisation, Administration, and Education. In this instalment the American system is described and compared with the plan of the Queensland Producers' Association—the outcome of the great agricultural advance of last year and the movement towards stabilised rural industry, which is gathering momentum every week in this State.—Ed.

Queensland is very largely dependent for her national existence upon her primary industries. She is desirous of filling her empty spaces and of establishing a vigorous and reasonably contented rural population. In that direction lies national safety and national prosperity. To accomplish that end farming must be made worth while; producers must receive a fair return for their labour; the country must be made as attractive in its way as the town; the lot of country women must be improved; the child of the country must be given the same advantages as the child of the city. When the prosperity of the producer is increased appreciably much will have been done to secure those objects, and three of the factors which will contribute mainly towards that prosperity are good seasons, suitable agricultural education and instruction, and efficient organisation.

Man does not control the seasons, but there is much which man can do to protect himself from the effects of adverse seasons. Experience, education, instruction, and organisation will help him. The experience he will gain for himself and through others. The Department of Agriculture provides instruction through the visits, demonstrations, and bulletins of its officers. As that instruction means so much to the farmer, it is obvious that the instruction should be sound; it is further obvious that if the instruction is to be sound it is essential that only qualified men should be appointed, and if the juniors of to-day are to become the seniors of to-morrow, those juniors must be trained efficiently. Hence the Queensland University should assist in the matter of research and of higher agricultural education.

"The Primary Producers' Organisation Act of 1922" has been passed by Parliament to provide for a unified organisation of the primary producers of Queensland, and the two cardinal principles of that organisation are to be—"Home Rule," namely, control by the producer for the producer—and "Co-operation." In regard to both instruction and experience organisation can be of great or little assistance according to the support which its members are prepared to give it. The Queensland Council of Agriculture is already trying to assist producers by the formulation of schemes for dealing with urgent and vital problems.

So far, the operations of the Q.P.A. have been directed by a provisional council representative of the various sections of the agricultural industry. Reports of the activities of the association have appeared from time to time in the Press, and those activities need no comment here. The L.P.A.s have been formed, the district councils have been elected, and the new Council of Agriculture will shortly be constituted; the time is therefore opportune to consider what precisely are the functions which each section of the organisation will discharge.

THE AMERICAN SYSTEM.

As a guide, a review of the American Farm Bureau and Farm Adviser movement may be interesting and helpful.

The Move Towards Rural Stabilisation.

Farm bureaux are a natural growth of the desire of the American farmers to do two things—first, to unite for mutual self-help and co-operation along any line that may be needed, and second, to get into close touch with those institutions of public enterprise and of government which have accumulated the information necessary to make farm life prosperous. The farm bureaux have no other function than to aid the development of rural life which, in turn, is the greatest stabiliser of national existence.

At various stages of the development of American agriculture many types of farmers' organisations have been brought into existence. Some have been successful; many have failed. That failure has usually been due to one or more causes—lack of a distinct purpose to fill a definite need, lack of membership sufficiently representative of all classes of farmers, lack of co-operation with similar organisations, lack of continuous and unselfish leadership. The farm bureau, it is claimed, has benefited by the experience of other organisations. It is not a social organisation, not an association for the purpose of lowering the prices of farm requisites and raising the prices of farm products, but an association of farmers who, by mutual co-operation, wish to investigate the fundamental problems involved in agricultural production.

Systematic Observation, Research, Experiment, and Record.

The theory that led to the farm bureau movement is that many of the farm problems have already been solved by individual farmers throughout the nation, but the solutions usually fall out of sight unnoted or are known only to particular individuals. Under the farm bureau scheme an attempt is being made to gather together in one county organisation the wide-awake and interested farmers who will compare their results with those of others, and in a systematic way plan out experiments and demonstrations on their own farms. Thus, the farm bureau may become a great experiment station with many observers, and a trained man—the farm adviser—to assist in interpreting results, point out new avenues of work and deduce conclusions from the evidence available. The conclusion is that the farm bureau can be of greater value to the community than the farm adviser and that together they can be of greater benefit than either alone. Though it must be emphasised that the main purpose of the farm bureaux is to increase the local knowledge of agricultural fact, many organisations act as general guardians of rural affairs and take the lead in advocating good roads, better schools, cheaper methods of buying and selling, and in promoting social institutions of country life.

A Live Factor in Rural Progress.

In some States the farm bureaux were not at first promoted by agricultural colleges, but were looked upon as a somewhat dangerous and untried procedure which might wreck the move for agricultural extension by paid workers. Later, this fear passed and the Colleges of Agriculture came to welcome the farm bureau as they saw more fully its possibilities of development and the progress which might be made in agricultural extension work when it was furthered by a large body of farmers. In the State of California, however, the value of the farm bureau was recognised from the beginning, and the College of Agriculture required every county which requested the services of a farm adviser to first form a farm bureau. The wisdom of this step has been proved by the fact that no county of California which has taken up farm bureau work has abandoned that work.

Farmers Control Their Own Affairs.

In planning the California type of bureau the constitution was very carefully written in order that no Federal or State official might have any direction over it. The organisation was definitely placed in the hands of farmers elected from among their membership and representing agricultural communities of the county. The belief upon which the constitution was based was that the farmers were wholly competent to guide their own affairs. As to its permanency, the theory was that if organisations

could be formed which would have programmes of work based upon concrete and feasible projects for the development of the community, the county, the State, and the Nation, the farmers would continue to attend meetings because of the efficiency of the organisation and because of their interest and part in the work it was doing. While the method under which the community centres are organised and directed is the same throughout the State, yet because the problems of the communities differ, the projects they have stressed are widely divergent.

Meetings—Farm Prosperity—Agricultural Policy.

The meetings of the community centres are usually held monthly. They are sometimes open to the public, but the business of the meetings is the serious discussion of questions pertinent to the farm prosperity of the neighbourhood. Sometimes the members go for a well-planned day to see demonstration plots that show definite results or to look at a well-built barn or well-bred herd. Such a trip is an inspiration as well as a source of knowledge, but it must be undertaken with a serious purpose and not as a pleasure jaunt. Again, some of the meetings are devoted entirely to the study of some phase of agricultural practice, such as the use of lime, sprays and spraying, balanced rations, methods of testing seeds, and so on—the farm adviser explaining in detail and using a blackboard, if necessary. The directors and officers of the county bureau also meet every month at the bureau offices or at the farm adviser's office. The meetings are of such vital interest that the whole of the directors attend—the agricultural policies of the county are determined, sectional committees are appointed, reports are heard from each director representing a centre and from departmental committees, and general consideration is given to the plans of work to be undertaken by the bureau and the farm adviser. The meetings may or may not be open to the public.

Subsidiary Organisations.

In addition to the general organisation, the members of the centres may form subsidiary organisations for more frequent meetings or more direct work in special directions. Thus, for example, the dairymen may wish to carry on co-operative cow testing, to purchase pure-bred sires; the pig raisers may wish to stamp out disease or to specialise in one breed of swine; the alfalfa growers may desire to uniformly grade their hay or to store it in co-operatively owned storehouses; and it becomes necessary to establish several departments or sections within the community centre. Each section elects a section committee, which reports through the director representing the centre to a corresponding committee of the county bureau, which in turn reports to the whole bureau, which is the final court to consider plans and reports of the several sections. It is in this way that the united agricultural force of the whole county is given to enterprises undertaken by any section, and financial, moral, and universal backing is given to a group of men who, standing alone, would not have sufficient strength to accomplish effectively the desired end.

The Largest Farmers' Organisation in the World.

State Federations, consisting of representatives of the county bureaux, and a National Federation consisting of representatives of the State Federations are also in existence, and a member on joining becomes part of the largest farmers' organisation that the world has ever known, and which includes some 1,500,000 members, 1,600 county bureaux, and 45 State Federations.

Summarised, the complete organisation is as follows:—

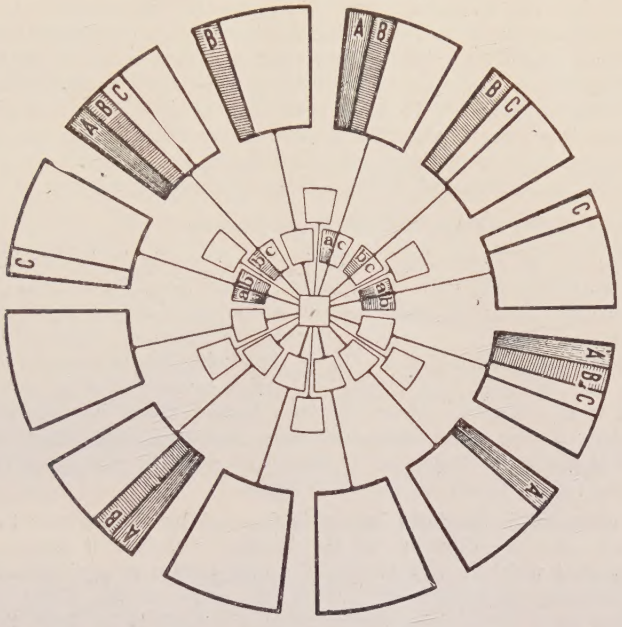
(1) Farm Bureau Centres, consisting of local farmers, who deal with local problems;

(2) County Farm Bureaux, consisting of representatives of the Farm Bureau Centres, who deal with county problems;

(3) State Federations, consisting of representatives of County Farm Bureaux, who deal with State problems;

(4) A National Federation, consisting of representatives of State Federations, which deals with national problems.

The following diagram illustrates the organisation of the county (district) bureau:—



A = Swine Breeders' Committee of the Farm Bureau Centres.
a = Swine Breeders' Committee of the County Farm Bureau.
A + a = Swine Breeders' Department of the Farm Bureau.
B = Cow Testing Committee of the Farm Bureau Centres.
b = Cow Testing Committee of the County Farm Bureau.
B + b = Cow Testing Department of the Farm Bureau.
C = Any Committee of the Farm Bureau Centres.
c = The same Committee of the County Farm Centres.
C + c = The same Department of the Farm Bureau.

THE FARM ADVISER.

Personality, Training, Qualifications.

A Farm Adviser is an official whose business it is to make available in practical form the results of the best-known farm practice and the knowledge of agricultural science, as developed by the State Experiment Stations and the Federal Department of Agriculture. He is expected to show by field demonstrations, publications, and otherwise, the application of such knowledge to local farm conditions. The Farm Adviser helps the settler or the beginner in the better selection of ground for certain crops, in better methods of planting, cultivating, pruning, spraying, harvesting, and marketing; he gives advice on soil treatment, fertilisation, animal husbandry, &c. Under the Californian system, the Farm Adviser is an officer of the Extension Service of the University College of Agriculture, and he is directly responsible to the Director of the Extension Service. His salary is paid by the College and the Federal Department of Agriculture co-operating. His travelling expenses are paid by the county to which he is attached. The most suitable Farm Adviser is the man who has been trained in agriculture, who is a graduate of a College of Agriculture, who has had practical experience, and who is familiar with the problems which concern the particular locality. It is essential that he should

possess enthusiasm, energy, and tact. As the success of agricultural extension work depends so much upon the Farm Advisers, the College will not appoint men until it is satisfied that they are qualified; rather will the College leave vacancies unfilled until efficient men are available. The Farm Adviser now works in conjunction with the Farm Bureau; in fact, a Farm Adviser is not appointed until a Farm Bureau has been organised. This arrangement has been made so as to facilitate the work of the Adviser, to conserve his time, to extend the range of his activities, and to provide an organisation to reach easily and quickly every community in the county. Under this scheme, also, the Farm Adviser himself gets the counsel and advice of the best farmers in the county, in addition to the assistance of the whole of the forces of the Agricultural College and the Federal Department of Agriculture.

Relationship of Farm Adviser to the Farm Bureau.

The value of the Farm Adviser to the producers is in having the unbiased judgment of an official who does not represent a local situation or local constituency, who is not subject to purely local control, whose appointment and term of office are not determined locally, but who represents the organised agricultural forces of the State and the knowledge that they have concerning the betterment of rural life. His value to the producers is in precise proportion to the extent to which he knows and tells the truth. He may advise the farm bureau (upon its request) as to the procedure which it may best follow, and may co-operate with it on most of the projects that it has under study, but in doing so it must be recognised that he is an official working for the benefit of the whole people.

On the other hand, the farm bureau is directed by the farmers through their representatives, who are directors of the bureau. When that bureau desires to carry on a project which is part or wholly in the nature of agricultural extension, then that part may properly come within the scope of the Farm Adviser. It may then draw up a written plan setting forth the work to be done, the means by which it is to be done, and the results they hope to accomplish, and clearly distinguish which part is to be done by the farm bureau, and which part by the Farm Adviser. This brings them into active co-operation on that particular project, but does not necessarily mean that the farm bureau will always work with the Farm Adviser, nor that the Farm Adviser is compelled to join in every movement that the farm bureau desires to further. To attempt to put the farm bureaux under the direction of the Government would deprive them of the primary reason for their existence, which is to represent the free and untrammelled action of the farmers of the country. Likewise, it would be unfortunate for the farm advisers to be placed under the direction of the bureaux, since it would deprive the farm advisers of their true mission, which is the advancement of the whole of the agricultural industry.

ORGANISATION IN QUEENSLAND.

What, then, can Queensland learn from the American organisation?

The American Farm Bureau organisation is very similar to our Queensland Producers' Association. The American Farm Bureau centres correspond with our Local Producers' Associations, the County Farm Bureaux with our District Councils, and the State Federation of Farm Bureaux with our Council of Agriculture. The Farm Adviser will not correspond exactly to our District Agents, but rather with the Instructors and Experts employed by the Department of Agriculture and Stock.

Co-Operation of the Queensland Producers' Association with the Department of Agriculture and Stock.

Under the Californian system the Farm Adviser is an officer of the College of Agriculture of the University of California. Seeing, however, that there is not a College of Agriculture in the Queensland University, then, so far as agricultural experts are concerned, the Queensland Department of Agriculture and Stock stands to the Queensland agricultural industry in the same relationship as the Californian College of Agriculture stands to the Californian agricultural industry. Seeing that

our experts and instructors are State officials, the control of them must remain with the State, but in the allotment of their duties, and in the making of the best use of their services for the benefit of the industry, there would be as cordial co-operation between the Council of Agriculture and the district councils on the one side and the Department of Agriculture on the other side as there is between the Californian Farm Bureaux and the Californian College of Agriculture. The Department of Agriculture would welcome an arrangement of the kind, provided that it were clearly understood that the control of the departmental officials must remain with the Department.

Efficient Administration.

For the effective discharge of the functions entrusted to the district councils and local producers associations by the P.P.O. Act, it is essential that an efficient administrative official should be attached to each district council—that official, whilst working under the direct control of the district council, however, should be an officer of the Council of Agriculture, and be under its general control. Keeping in view, therefore, the functions of the departmental experts and instructors, and the special duties which the district agent will be expected to perform, the type of officer required for the position of district agent will be one who has capacity for organisation and leadership, who has secretarial and business ability, who has had practical agricultural experience, and who knows local conditions.

The Future of the Queensland Producers' Association.

In regard to the future of the Queensland Producers' Association, American experience suggests—

(1) That the HOME RULE policy of the Association should be preserved zealously;

(2) That the Council of Agriculture should construct a definite programme for each section of the industry, and work consistently for the realisation of that programme, subject to such variations as developments from day to day require. The projects should consist of big essentials and not minor details, and the general aim should be to strengthen and assist existing co-operative agencies and not to absorb them. Similarly, the projects of the district councils and the local producers' associations should be planned at the beginning of each year, and these projects should deal generally with the requirements of the district as a whole, and specifically with the area covered by a L.P.A. or by a group of L.P.A.'s. Each district council should also assist the Council of Agriculture in the construction of its programme.

State Encouragement of Agriculture.

In regard to the activities of the State for the encouragement and organisation of agriculture, American methods suggest—

(1) That the State appropriation for agricultural purposes in Queensand should be as nearly as possible commensurate with the importance of primary industries to national existence, and keeping especially in view the adequate staffing of the Department of Agriculture and Stock.

(2) That adequate provision should be made for the agricultural training of future agricultural experts, including teaching staffs, field officers, and agriculturists, by an extension of agricultural education in the Rural Schools, and by the establishment of a College of Agriculture in the University.

(3) That there should be complete co-operation on the part of official experts and instructors with the Council of Agriculture, District Councils, and Local Producers' Associations.

The next Article of this Series, on Packing, Grading, and Marketing, will appear in the April Journal.

TOWNSVILLE STOCK EXPERIMENT STATION.

A YEAR'S REVIEW.

BY JOHN LEGG, B.Sc., B.V.Sc., M.R.C.V.S., Director.

The subjoined review is an abstract from the Annual Report of the Under Secretary for Agriculture and Stock (Mr. Ernest G. E. Scriven) to the Minister for submission to Parliament.

Several visits have been paid into country districts in connection with reported outbreaks of disease among stock. One long trip was again paid to the Gilbert River this year with the Government Botanist, but, although it was hoped that some valuable evidence would be obtained in connection with the disease known as the Gilbert River horse disease, only two cases of the disease were seen, and both of these were probably atypical.

Immunisation of Cattle Against Tick Feve

The stud cattle received for inoculation for the year ending 30th June, 1922, consisted of 72 bulls and 7 heifers.

The method of inoculation was that usually practised and needs little comment—the blood being used soon after being drawn from a recovered animal, usually in doses of 5cc., but occasionally larger. Where larger doses have been used, no material difference has been noted in the type of reaction produced. This, of course, is what would be expected, as the type of reaction does not depend on the size of the dose, but upon the susceptibility of the animal inoculated, and, perhaps, to some extent, on the particular strain of organism used. It is worth noting here in this connection that all the deaths that have occurred from redwater in the Townsville Experiment Station in the last two years have followed the use of blood from one particular animal, and it has been noticed on several occasions that blood from this particular animal tends to produce a type of reaction severer than that of several other animals used.

Testing of Bleeders.—It is necessary to test fresh recovered animals occasionally in order to ascertain whether they can be used as bleeders, because it is found that at times the blood of some animals is not capable of setting up reactions in susceptible cattle. Blood from animals from tick-infested country, and themselves being infested with ticks, has been repeatedly tested by the writer and found to be incapable of producing a reaction in susceptible cattle.

Unfortunately, there is no other method of testing blood than by inoculation in susceptible cattle, and the supply of these latter is not always available.

Claim has been made that by a special method of staining piroplasms could be detected in the blood of recovered animals (Pound; Annual Report, Department Agriculture, Queensland, 1919-20), but, unfortunately, in the report referred to no details of the special method are given. As, however, the inability to detect piroplasms in the blood of recovered animals under ordinary circumstances is not due to our inability to stain them (for there are some very excellent stains used in the detection of protozoa in the blood, such as the Leishmann, Giemsa, and Jenner methods), but to their comparative rarity in the blood, it is not likely that such a claim will be substantiated.

At the present moment the only method of testing blood is the one indicated.

Mortality at Experiment Station.—During the two years ended 30th June, 1922, 278 head of cattle have been received at the Townsville Experimental Station for inoculation purposes. Particulars of the deaths that have occurred are as follows:—

Animal.	Date of Death.	Cause of Death.
Bull ..	12 July, 1921	Septicæmia, abscess formation
Bull ..	17 June, 1921	Arsenic poisoning after dipping
Bull ..	25 May, 1921 (destroyed)	Abscess hock
Bull ..	4 August, 1921	Tick fever
Bull ..	5 August, 1921	Tick fever
Bull ..	2 September, 1921	Gastric tympany
Bull ..	7 December, 1921	Tick fever
Bull ..	7 December, 1921	Tick fever
Bull ..	10 January, 1922 (destroyed)	Tick fever and abscesses
Bull ..	10 June, 1922	Tick fever

Total deaths, 10. Percentage, 3·6 per cent.

Deaths from Tick Fever, 6. Percentage, 2·16 per cent.

It will be noted in the above table that two deaths from redwater occurred on 7th December, 1921, and one bull was destroyed on 10th January, 1922. These were three animals from a lot of twelve bulls which had been inoculated at the end of November, 1921. Unfortunately, commencing about ten days after the inoculation, and when the animals were at the height of their reactions, a few days of very hot weather were experienced. The whole twelve animals were very much distressed, two dying and one other becoming very much weakened, and finally developing abscesses in the knees and elbows where the skin had been bruised, thus necessitating its destruction on the 10th January following. It is believed that, although the mortality from redwater has been comparatively low during the last two years, had cooler weather been experienced when this particular lot of animals was inoculated, the mortality would have been lower still.

Loss of Virulency in Redwater Blood after being drawn.—In my last annual report I drew attention to the possibility of blood losing its infectivity soon after being drawn from an animal used for bleeding purposes. The question is of great importance, for the reasons mentioned in the report referred to. No experiments have recently been performed in this connection at Townsville, owing to there being no susceptible cattle available for inoculation purposes; but towards the middle of last year three samples of blood were received at Townsville from the Yeerongpilly Experimental Station for inoculation purposes, and the manner in which this blood was used constituted an ideal experiment. It is presumed, of course, that these samples of blood would all have been drawn from bleeders which had been tested before, although the writer is not certain on this point. It was not anticipated that this blood would prove avirulent, but it did so, and, although the samples were tested on several head of susceptible cattle, in *not one instance was a reaction produced,* and each and every one of the cattle so inoculated proved subsequently to be susceptible to the disease.

The following is extracted from a report forwarded to the Chief Inspector of Stock, dated 10th August, 1921. The samples of blood received are marked Y1, Y2, and Y3 respectively:—

Sample Y1. Received 23/5/21. Approximate age 96 hours.
Sample Y2. Received 7/6/21. Approximate age 96 hours.
Sample Y3. Received 15/6/21. Approximate age 120 hours.

The three samples have been named Y1, Y2, and Y3, and will be referred to as such throughout. In each case the inoculation was made behind the near shoulder with a 5 cc. sterile hypodermic syringe as soon as the bottle was opened, and with the usual antiseptic precautions.

Bull No. 28.—Two-year-old Shorthorn. Imported from New South Wales:—

23/5/21. Inoculated 10 cc. blood, sample Y1.

24/5/21. Temperature rose to 105·6.

25/5/21. Temperature 105·4.

26/5/21. Temperature normal.

7/6/21. Inoculated 5 cc. blood, sample Y2. Night of 7th temperature rose to 104·8. Fell to normal next morning.

14/6/21. Bull turned into yard at owner's request.

Blood smears taken 23/5/21 to 14/6/21 were all negative.

Temperature and smears were not continued long enough to ascertain whether the animal had reacted after the second inoculation, but the bull showed no signs of illness.

12/7/21. Inoculated 5 cc. blood from one of our own bleeders "B." Temperature fluctuated from 12/7/21 to 24/7/21 between 101·5 and 103.

Smears over these dates were negative.

25/7/21. Temperature 102·8. Blood smears showed numerous piroplasma bigeminum.

26/7/21 (morning). Temperature 106·6. Blood smears showed fully 25 p.c. of red blood corpuscles invaded by the piroplasms.

(Midnight). Temperature 107·6. Animal prostrate, urine coffee-coloured. Laboured breathing. Gave 1 gram trypan blue in 100 cc. water.

27/7/21. Temperature 101·5. Smears showed very few parasites.

28/7/21. Temperature 101·5. Smears negative.

From this date on the animal made an uneventful recovery, its blood showing the usual lesions seen in piroplasmosis, poilikocytosis, polychromatophilia, granular basophilia, &c.

Bull No. 29.—Two-year-old Shorthorn. Imported from New South Wales. The history of this bull was exactly that of 28, being inoculated on same dates with same amounts of blood, turned out on the 14/7/21 at owner's request.

Its immunity was tested in the same manner on 12/7/21 by using 5 cc. blood of bleeder "B."

12/7/21. Inoculated with 5 cc. blood bleeder "B."
19/7/21. Temperature 103·2. Smears showed few piroplasms.
20/7/21. Temperature 103. Smears showed few piroplasms.
21/7/21. Temperature 104·6. Piroplasms scarce in blood.
22/7/21. Temperature 106·4. Piroplasms very numerous.
23/7/21. Temperature 101·6. Piroplasms very numerous.

Smears were continued until 27/7/21, when they were still positive, but as the animal's temperature had subsided it was turned out of the stalls.

Bull No. 37.—Two-year-old Devon. Imported from New South Wales:—

7/6/21. Inoculated 5 cc. blood sample Y2. Bull turned into yard on the 10th and kept under observation. It never showed any signs of illness and was got ready for show purposes. Owner then decided not to show the animal and it was tested as follows:—

13/7/21. Inoculated 5 cc. blood from bleeder "B."
19/7/21. Temperature 103·1. Piroplasms bigeminum numerous in blood.
20/7/21. Temperature 104·4. Piroplasms bigeminum very numerous.
21/7/21. Temperature 104·8. Piroplasms bigeminum very numerous.

Organisms were present in the blood for the next four days, when they gradually disappeared, the temperature at the same time falling gradually to normal. The blood showed the usual pathological changes seen in piroplasmosis, these gradually disappearing also, the animal making an uneventful recovery.

Bulls 67-76.—Ten young Shorthorn bulls, each inoculated with 5 cc. blood sample Y3 on 20/6/21. The animals were all treated the same way, hence are grouped together. As there were ten animals, the test of this blood can be considered as fairly exhaustive. Temperatures and smears were commenced on the 25/6/21 and continued until the middle of July. In no case did organisms appear in the blood of any of these animals, but the temperatures fluctuated somewhat. Many of the animals were, however, suffering from acute ophthalmia, which possibly influenced the temperatures.

Bulls 175-179.—Five young Shorthorn bulls inoculated with 5 cc. blood sample Y3 on 6/7/21. Temperatures and smears, taken between 16/7/21 and 19/7/21 inclusive, showed slight fluctuations in temperature, whilst smears were negative.

All these fifteen animals were then inoculated with the blood of bleeder "D," one of our own bleeders, but although blood examinations were continued they were negative in every case, and the temperatures showed no redwater reactions. This result was unexpected, because bleeder "D" had been tested on five consecutive bulls in June, and had given good reactions in each case. It was thought that the fifteen animals were immune as a result of the inoculation with blood on the 6/7/21 and our examination of the blood had been defective, inasmuch as we had been unable to detect organisms, although in all other cases previously we had no trouble in finding the piroplasm bigeminum, even though scanty.

It was then decided to again test the animals with the blood of bleeder "B," an animal which had never failed to produce a reaction in susceptible animals for a month previously. The inoculation was carried out on 19/7/21, a dose being 5 cc. in each case.

It is unnecessary to give the details of each of these fifteen cases, but in every one of the fifteen animals piroplasms appeared in the blood during the following fortnight, and remained in the blood for from one to six days. Several of the animals became very sick and passed red urine, and one, No. 70, died on the 5th August of redwater. This animal had shown a continuous high temperature from the eighth day after inoculation, with numerous organisms in its blood.

Conclusions.—

1. The blood sample Y1 when tested on susceptible bulls 28 and 29 produced no reaction and gave the animals no immunity to redwater.
2. That blood sample Y2 when tested on susceptible bulls 28, 29, and 37 produced no reaction and gave no immunity. Each of the above three animals passed through a typical redwater reaction some weeks subsequent to the above inoculations when inoculated with blood from bleeder "B."
3. That blood sample Y3 produced no reaction and conferred no immunity on bulls 67-76 and 175-179, each of these animals subsequently passing through a typical redwater reaction some weeks subsequent to the above inoculations when tested with blood from bleeder "B."

These experiments should be continued further, and we hope to be able to test this question in the near future by using blood from our own animals.

Analytical Branch.

The work of the analytical chemist is contained in Appendix 1 attached to this report. It is noted that many dip-owners are not sending in samples as required by the Act, and in view of the fact that so many samples are below the standard strength it is suggested that an example be made of one or two of the worst offenders and a prosecution instituted.

The registration of dips is kept well up by some stock inspectors each year. Other districts are very much behind. It is quite evident that the administration of this portion of the Act, at least, is largely a question of the personal element.

Tetanus.

This disease seems to be particularly rife in the small towns of the North. In many cases it runs a very acute course once symptoms have set in. It is believed that the organism does not vary very much in its virulency, and the acute course of the disease can only be put down to the individual susceptibility of the animal concerned.

Antitetanic sera have been used in many cases, but their value is very doubtful. It is intended to test the value of subcutaneous injections of magnesium sulphate solution in the near future, if possible.

Mastitis in Cattle.

This appears to be a fairly common disease, and affects many milking cows along the coast. The disease usually runs a benign course and is of a chronic nature. Frequently it does not show very much tendency to spread from one quarter to another, although it is commonly seen in several cattle belonging to the one herd and is apparently of a contagious nature. Owing to the present cheapness of cattle, it is advisable to turn any affected cattle into beef, and not attempt curative measures.

Vaccines are produced by commercial firms for the treatment of this condition, and also many so-called specifics for udder injection, but the value of these is very doubtful.

Gilbert River Horse Disease.

A visit was paid to the Gilbert River early in the year in order to study the symptoms of this disease, to make post-mortems, and to obtain pathological material if possible, and, with the Government Botanist, to make a survey of the plants of the area, as it has been long suspected that the disease has been of the nature of a plant poison.

The visit was very disappointing in many ways. It was expected that a considerable number of cases would occur during the wet season, as there were considerable rain and floods during the six weeks we remained on the river, yet only two cases of the disease occurred, and both these were probably atypical.

The post-mortem in these two cases showed two marked features—*i.e.*, very great distension and engorgement of the stomach with foodstuffs, and, microscopically, a peculiar mottled greenish condition of the liver, which on microscopic examination proved to be a condition of necrosis. It is believed that the condition of necrosis of the liver is the primary lesion in the disease and is sufficient to account for the symptoms, but a study of only two cases is not sufficient to allow of conclusions being drawn.

If this condition is found in all cases, it will bring the disease into line with the disease known as "Staggers" in South Africa and also another disease known as "Dunziekt" in the same country, both diseases being due to liver necrosis and both suspected as being due to plant poisoning.

No plants were found which might be likely to cause the condition, but there are several which it would be better to test. Included among these are some specimens of the genera *Crotalaria* and *Indigofera*.

Further study in connection with this disease should first be made by ascertaining whether this condition of hepatitis (and necrosis) occurs in all cases. At present it appears to be the significant lesion in the disease, but only further study will reveal as to whether it is invariable or not.

Blackleg.

Several reports of the previous Government Veterinary Surgeons in the North have indicated that this disease occurs periodically about the Don River in the Bowen District.

It is believed that many crude methods of vaccination are being used in connection with this disease, such as the inoculation of garlic and turpentine into the skin of the brisket.

Lantana Poisoning in Cattle.

This condition was fairly common during the last wet season, particularly in the Cairns District. As usual, it was commonly found among cattle brought down from the Tableland country by the butchers for killing purposes, these cattle, when being turned into paddocks along the coast, taking at once to the lantana. Cattle seem to have a much greater liking for the young shoots than for the older plants.

Septic Infection of the Feet of Imported Sheep.

During the cooler months of the year a large number of flock rams are imported from New South Wales into Queensland, and many of these pass through Townsville.

One consignment of about 200 was received in Townsville in April last, and many of these animals were suffering from injuries to the feet. The ten days that the sheep were on the boat were very wet ones, and the sheep were in all probability standing in water on iron decks a considerable portion of the time. A cracking of the skin between the toes of a good many was produced, probably owing to the animals slipping and sliding on the deck, and through these injuries infection had crept in. Small abscesses formed in between the toes and around the coronet, and there discharged a greensh-blue pus, and was probably due to the bacillus pyocyaneus. The animals became very distressed and were unable to shift about and obtain feed for themselves. The exact percentage of deaths is not known, but the mortality was very high.

Ankylostoma Duodenale in Pigs.

The discovery of this parasite, the common hookworm of man, in the pig in North Queensland is largely due to the initiative and energy of an officer of this Department (J. A. Rheuben, Slaughtering Inspector, Townsville). Particular credit is due in this instance to this officer, because several attempts had previously been made by those interested to ascertain whether this parasite occurred in the pig or not. All previous investigations have been negative in their results.

The following is extracted from the "Medical Journal of Australia," dated 5th November, 1921, under the heading "Notes on the finding of Ankylostoma duodenale in the Intestines of the Pig," by John Legg and J. A. Rheuben:—

O'Connor reported in the "Medical Journal of Australia" for 2nd October, 1920, the finding of Ankylostoma duodenale in the intestine of the pig in Funafuti, Ellice Island. Following on this, Maplestone reported in the "Medical Journal of Australia," on the examination of 182 pigs from the Townsville district of Queensland, with negative results in each case.

So far as the writers are aware, no case has been reported of the occurrence of Ankylostoma duodenale in the intestine of the pig in Australia.

During July last a small number of pigs from Cromarty, a small railway siding about 20 miles from Townsville, was killed, and in accordance with the usual practice, the intestines were examined by one of us (J.A.R.) for parasites.

In three of the animals nematodes closely resembling Ankylostoma duodenale (man) were found attached to the mucuous membrane of the duodenum; they were identified as such by Dr. G. Sweet, of the Melbourne University.

The pigs in question were semi-domesticated.

The discovery of the Ankylostoma duodenale in pigs in North Queensland would seem to us to be of importance, and to suggest the carrying out of experiments to ascertain with what facility pigs can be infected from human sources.

Paralysis in Dogs Due to the Bite of Scrub Ticks.

Paralysis in dogs seems to be fairly common in places along the coast in North Queensland. It was always believed that this was due to the bite of scrub ticks, but this had never been tested. A recent report of Dodd in the "Journal of Comparative Pathology and Therapeutics," Part 4, 1921, contains details of certain experiments which he has performed in this connection, which would seem to indicate that there is little doubt that this condition is caused by the bite of the scrub tick. The condition is more common in young than in old dogs. Dodd suggests that this is probably due to a greater susceptibility of the young animals.

JOHN LEGG,
B.Sc., B.V.Sc., M.R.C.V.S.

APPENDIX.

The analytical work performed during the year was principally in connection with dipping fluids, of which 538 samples were submitted, with the following result:—

·6 per cent.	(last year 1·4 per cent.)	contained up to 2 lb.	Arsenious Acid per 400 gallons.
3·6 per cent.	(last year ·9 per cent.)	contained from 2 to 4 lb.	
15·8 per cent.	(last year 15·6 per cent.)	contained from 4 to 6 lb.	
16.5 per cent.	(last year 16·6 per cent.)	contained from 6 to 7 lb.	
19·3 per cent.	(last year 21·1 per cent.)	contained from 7 to 8 lb.	
23·8 per cent.	(last year 20·3 per cent.)	contained from 8 to 9 lb.	
10·7 per cent.	(last year 11·1 per cent.)	contained from 9 to 10 lb.	
9·7 per cent.	(last year 13·0 per cent.)	contained 10 lb. and over	

of which—

81·5 per cent.	(last year 80·3 per cent.)	were free from oxidation	Arsenic Acid per 400 gallons.
1·2 per cent.	(last year 4·9 per cent.)	contained from 0 to ·5 lb.	
1·6 per cent.	(last year 1·3 per cent.)	contained from ·5 to 1 lb.	
4·3 per cent.	(last year 4·1 per cent.)	contained from 1 to 2 lb.	
4·2 per cent.	(last year 3·4 per cent.)	contained from 2 to 3 lb.	
7·2 per cent.	(last year 6·0 per cent.)	contained 3 lb. and over	

In addition there were also analysed:—

Dipping concentrates	5
Samples from departmental dip and spray	18
Waters (partial)	4
Arsenic	5
Viscera and stomach contents	23
Miscellaneous	6

whilst 19 pints of standard iodine were prepared and despatched, 10 pints being for the use of inspectors.

Dipping Fluids.

The number of samples submitted this year (538) shows a marked increase over the total (378) for last year, but the position in this regard is still very disappointing, as can be seen from the following table:—

Year.	Number Registered.	Number Submitted.
1919-1920	668 ..	539
1920-1921	456 ..	378
1921-1922	606 ..	538

Perhaps if a few prosecutions in several stock districts were made, under Regulations 29, 1, and 6 (analysis), and 30 (registrations) of the Diseases in Stock Act, owners might be made to realise that the Act just quoted is a very important and live one.

Although the number of registrations this year seem to be well forward (90 per cent. approximate), still a good number have only just come to hand, whereas they should be registered by 31st January.

Again, it should also be enforced that correct information be forwarded with each sample, and no analysis be carried out unless the form of questions (4th Schedule) accompanies such sample.

Viscera and Stomach Contents.

Of the twenty-three samples examined, the cause of death was ascertained in fifteen cases; the high percentage of positive results being accounted for by several samples from the same source being tested separately at different periods

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PURE SEEDS AND STOCK FOODS ACTS.

A YEAR'S ADMINISTRATION.

BY F. F. COLEMAN, Officer in Charge, Seeds, Fertilisers, and Stock Foods Investigation Branch.

The following administrative review is taken from the Annual Report of the Under Secretary for Agriculture and Stock (Mr. Ernest G. E. Scriven) to the Minister (Hon. W. N. Gillies) for presentation to Parliament:—

The operations of the Stock Foods Act have brought this branch into more constant touch with manufacturers, produce merchants, and general storekeepers, and the business has greatly increased.

The constant stream of callers has taken up a large amount of time, and many complex problems meriting immediate research have resulted, but, unfortunately, little can be done in this direction, owing to the increasing demands made on the staff by general work and the investigation of the many complaints received, all of which have been carefully considered, and forty-eight complaints as to the quality of agricultural seeds or stock foods investigated. This has necessitated the visiting of the undermentioned districts:—Allora, Atherton, Babinda, Brisbane, Bowen, Cairns, Clifton, Caboolture, Eumundi, Forest Hill, Gympie, Gayndah, Gordonvale, Killarney, Kingaroy, Landsborough, Mackay, Maryborough, Malanda, Murgon, Myola, Nambour, Nanango, Pomona, Peeramon, Rockhampton, Rosewood, Stanthorpe, Townsville, Toowoomba, Warwick, Woodford, Yangan, and Yungaburra.

Definition of Vendor.

A vendor under the Pure Seeds Acts is "any person who sells, or offers or exposes for sale, or contracts or agrees to sell, any seeds." It will therefore be noted that the common acceptance of the Acts as referring only to seedsmen is erroneous.

Large quantities of seeds are sold as seed for sowing by farmers, storekeepers, and produce merchants, most of whom are without any seed-cleaning machinery, or any desire to obtain even a set of suitable sieves or the cheapest of cleaning machines.

Purity Analyses.

Table I. gives the germinating capacity of the principal agricultural seeds, with the standards of germination prescribed by the regulations under the Acts. Table II. gives the purity analyses of the same, which are, with the exception of rye, tares, oats, and a few samples of lucerne, the produce of Queensland. Owing to the large quantities

of ungraded seeds held by produce merchants and frequently stored by them on behalf of the grower, it has been found necessary to alter the methods of examination and make complete purity analyses as well as germination tests of all sampes sent in for examination by vendors or obtained by an officer under the Acts. This has more than doubled the work, but it is now possible to identify a particular sample by keeping a careful record of its various characteristics.

Section 6 of the regulations permits of the sale by farmers of "as grown" seeds, providing such seeds are sold to seed merchants for cleaning or grading. Unfortunately, a definition of a seed merchant is not given in the regulations; it is, however, generally understood that a seed merchant refers to any vendor in a position to clean and handle seeds in large quantities; in other words, a seed merchant is any vendor with one or more efficient seed-cleaning machines and the will to put them to daily use.

Amending Legislation Suggested.

Consideration might well be given to such amending legislation as will provide for the registration of seed merchants, as defined by the preceding paragraph, to whom section 6 of the regulations applies, also to the compulsory labelling of all agricultural seeds. Such labelling is in operation in other countries, the label attached to each package giving the following particulars:—

Kind of seed:
Where grown:
Purity, per cent.:
Inert matter, per cent.:
Weed seeds, per cent.:
Germination, per cent.:
Date of test:
Name and address of vendor:

Under the Pure Seeds Acts the seller must give to the buyer an invoice stating that the seeds are for planting or sowing, and that they contain no greater proportion or amount of foreign ingredients than is prescribed. Vendors, however, frequently give an invoice without first ascertaining the purity or germination of the seed. No one can honestly give any such document without an analysis of a sample drawn from the actual bulk in the seller's possession. Even such articles as oats, barley, &c., of which both buyers and sellers may be able to judge the market price, require a purity analysis and germination test.

Imported Seeds.

Table III. gives the purity and germination of the principal imported seeds, with the countries from which they were shipped. It does not always follow that the port of shipment is in the country of origin. From the table it will be observed that the purity and germination is, on the whole, satisfactory.

It is proposed to make a similar Table for vegetable seeds sold by the various vendors in small packets. Many complaints were received as to the poor germination of vegetable seeds purchased by market gardeners, several samples of cabbage growing less than 20 per cent., carrots less than 29 per cent., and cucumbers less than 20 per cent. The vendors of such seeds would therefore be well advised to destroy their old stocks and rely on the freshly imported seeds referred to in Table III.

In addition to the vegetable seeds above mentioned, 177 consignments were imported by parcels post. These contained hundreds of small commercial quantities, the quality of which were not up to the bulk seeds, and many small lots imported by private persons contained weed seeds. All such packages when large enough were recleaned in quarantine.

Misuse of Certificates.

Attention has been directed to the misuse of certificates relating to samples sent in by vendors, which certificates are not a guarantee by the Department as to the quality of the bulk that the sample is supposed to represent, but a plain statement of facts revealed by a purity analysis and germination test of the sample received. Both buyers and sellers are encouraged to send in samples for analysis, the report in most cases being in the form of a certificate, for which a fee of 2s. 6d. is charged. It is of the utmost importance that the samples be drawn from the actual seed in the sender's possession and that they be truly representative of the bulk. Instructions as to sampling, &c., have been issued in leaflet form; nevertheless, every month brings many samples of both seeds and stock foods without the name or address of sender. Over 200 of such samples came in during the last six months. Nearly as many were too small for any determination to be made. Unless proper care is exercised by senders, delays in the issue of reports will continually occur.

TABLE I.

Germinating Capacity of Agricultural Seeds, 1921-1922.

	Percentage of Samples Germinating Between—										Standards of Germination prescribed by the Pure Seeds Acts.	
	100–90	89–80	79–70	69–60	59–50	49–40	39–30	29–20	19–10	9–0	A Grade.	B Grade.
	%	%	%	%	%	%	%	%	%	%	%	%
Barley, Cape	100·0	..	..	..	..	..	..	..	..	..	90	75
Barley, Skinless	30·8	53·9	7·6	7·7	..	..	..	..	..	..	90	75
Canary	22·3	55·5	11·1	..	11·1	..	..	..	..	..	75	60
Cowpea*	34·5	17·2	17·2	10·3	3·5	6·9	6·9	3·5	..	..	75	65
Lucerne*	8·3	18·7	20·8	31·3	14·6	2·1	2·1	2·1	..	..	80	60
Millet, Foxtail (Setaria)	51·9	29·6	7·4	..	..	7·4	..	3·7	..	..	75	60
Millet, Japanese	65·3	10·2	6·1	6·1	2·1	2·1	2·0	4·1	2·0	..	75	60
Oats	77·3	15·9	4·5	..	..	..	..	..	..	2·3	85	70
Panicum, White	16·0	32·0	20·0	16·0	4·0	..	4·0	8·0	..	..	75	60
Paspalum	..	..	..	..	..	10·9	5·5	16·4	21·8	45·4	25	10
Prairie Grass	4·2	12·5	12·5	29·1	12·5	8·2	4·2	8·4	..	8·4	60	40
Rhodes Grass	..	..	1·1	7·4	15·8	19·5	21·6	14·2	14·6	5·8	35	20
Rye	20·0	..	40·0	..	..	20·0	20·0	..	..	..	90	75
Sorghum	20·0	30·0	35·0	10·0	5·0	..	..	..	..	..	75	60
Sudan Grass	26·4	36·1	16·6	6·9	7·0	4·2	1·4	..	..	1·4	75	60
Tares	100·0	..	..	..	..	..	..	..	..	..	80	65
Beans, Canadian Wonder	70·6	17·6	..	..	..	11·8	..	..	..	..	75	65
Peas	61·1	22·2	5·6	..	..	5·6	..	5·5	..	..	80	65

* Lucerne and Black Cowpea Seeds of Queensland growth frequently contain a large amount of Hard Seeds, which are seeds with seed coats so impervious to water as to delay germination. The figures appearing below give the average plus amount in the samples germinating between the percentages at the top of the column. When the amount of Hard Seeds present in any sample exceeds 10 per cent., it is obvious that the effective germination is greatly reduced.

	100-90	89-80	79-70	69-60	59-50	49-40	39-30	29-20	19-10	9-0
	%	%	%	%	%	%	%	%	%	%
Percentage of hard seeds in Lucerne	5·0	10·7	13·8	23·6	39·7	48·0	54·0	..	..	..
Percentage of hard seeds in Black Cowpea	..	3·0	12·4	4·0	..	47·0	..	..	..	..

TABLE II.

PURITY ANALYSES OF AGRICULTURAL SEEDS, 1921-1922.

PERCENTAGE OF SAMPLES CONTAINING NOT MORE THAN 1 PER CENT. TO NOT MORE THAN 70 PER CENT. OF INERT MATTER AND WEED SEEDS.

—	1	2	3	4	5	10	20	30	40	50	60	70	Principal Weed Seeds in their order of occurrence.*					
	%	%	%	%	%	%	%	%	%	%	%	%						
Barley, Cape ..	30·7	..	69·3	..	..	..	..	..	..	..	..	..	1	47	48	30	34	2
Barley, Skinless ..	..	..	46·2	..	30·8	23·0	..	..	..	..	..	..	48	58	47	27	39	..
Canary	..	..	22·3	..	22·3	55·4	..	..	..	..	..	..	27	19	45	30	41	7
Cowpea	37·9	13·8	20·7	3·5	6·9	10·3	6·9	..	..	..	..	..	35	49	..	..	..	..
Lucerne	12·5	12·5	45·9	6·3	6·2	8·3	8·3	..	..	..	..	..	11	42	45	3	50	34
Millet, Foxtail (Setaria) ..	14·8	3·7	48·2	3·7	25·9	3·7	..	..	..	..	..	..	28	12	36	3	19	50
Millet, Japanese ..	18·4	16·3	38·8	10·2	12·2	2·1	..	2·0	..	..	..	..	39	3	41	45	19	58
Oats	8·0	12·0	34·0	8·0	18·0	16·0	4·0	..	..	..	..	..	1	30	8	34	45	19
Panicum, White ..	20·0	8·0	56·0	..	8·0	8·0	..	..	..	..	..	..	39	22	50	61	49	11
Paspalum	20·3	18·6	37·3	5·1	13·6	3·4	1·7	..	..	..	..	..	39	22	45	23	61	49
Prairie Grass ..	12·5	8·4	29·1	4·2	29·1	4·2	4·2	8·3	..	..	..	..	1	47	2	37	31	32
Rhodes Grass ..	3·7	14·6	22·7	13·2	14·2	17·9	10·0	0·5	..	1·1	1·6	0·5	13	24	39	59	11	60
Rye	20·0	..	80·0	..	..	..	..	..	..	..	..	..	8	1	62	..	..	..
Sorghum	25·0	..	45·0	5·0	15·0	10·0	contained inert matter						..	..	..	..	..	..
Sudan Grass ..	5·5	8·3	57·0	5·6	12·5	9·7	1·4	..	..	..	..	..	39	19	28	3	11	16
Tares	50·0	..	..	..	50·0	..	..	..	..	..	..	..	7	33	45	11	..	..
Beans .. .. (Canadian Wonder)	64·7	..	29·4	5·9	contained inert matter					..	..	..	..	..	..	..	..	..
Peas	55·0	5·0	40·0	contained inert matter					..	..	..	..	..	..	..	..	..	..

The Standard of Purity prescribed for A Grade Seeds is not more than 2 per cent. of inert matter, not more than 1 per cent. Weed seeds. For B Grade Seeds not more than 3 per cent. of inert matter, not more than 2 per cent. Weed seeds. These standards apply to all seeds herein mentioned, except Barley, Oats, and Rye, the standards for which are—A Grade not more than 1 per cent. of Inert Matter, 1 per cent. Weed Seeds, and 1 per cent. of any cultivated cereal other than the kind to which the sample belongs. Seeds less in diameter than one-fourteenth of an inch none. The Standard for B Grade gives a greater latitude.

* See note next page.

*WEED SEEDS OF FREQUENT OCCURRENCE.

1 *Avena fatua*, Wild Oat.
c2 *Apium, sp.*
3 *Amarantus sp.*
4 *Aristida sp.*, Spear Grass.
5 *Andropogon sp.*
a6 *Anagallis arvensis*, Common Pimpernel.
c7 *Brassica sp.*
8 *Bromus maximus*, Great Brome.
9 *Bromus mollis*, Soft Brome Grass.
10 *Bidens pilosa*, Cobbler's Pegs.
c11 *Chenopodium sp.*
c12 *Centaurea Melitensis*, Star Thistle.
13 *Chloris divaricata.*
14 *Chloris barbata.*
15 *Chloris truncata.*
16 *Cnicus lanceolatus*, The Common Thistle.
17 *Cuscuta sp.*, Dodder.
18 *Caucalis sp.*
a19 *Datura stramonium*, Thorn Apple.
20 *Diplachne parviflora.*
c21 *Daucus brachiatus.*
22 *Eleusine indica*, Crow's Foot.
23 *Erichloa punctata*, Early Spring Grass.
24 *Erigeron linifolius.*
25 *Eragrostis sp.*
26 *Festuca sp.*, Fescue.
c27 *Geranium dissectum*, Cut-leaved Geranium.
28 *Hibiscus trionum*, Bladder Ketmia.
c29 *Hypochœris, sp.*, Cat's Ear.
b30 *Lolium temulentum*, Darnel.
c31 *Lepidium ruderale*, Waste-places Cress.
32 *Lithospermum arvense*, Corn Gromwell.
c33 *Lepidium campestre*, Pepper Grass.
c34 *Melilotus parviflora*, Hexham Scent.
35 *Malvastrum tricuspidatum*, False Mallow.
c36 *Marrubium vulgare*, White Horehound.
37 *Malva parviflora*, Small-flowered Mallow.
c38 *Medicago denticulata*, Medic Burr.
39 *Panicum sanguinale*, Summer Grass.
40 *Panicum decompositum*, Barley Grass.
41 *Polygonum convolvulus*, Climbing Buckwheat.
42 *Polygonum aviculare*, Wireweed.
43 *Plantago lanceolata*, Rib Grass.
44 *Portulaca oleracea*, Pig Weed.
45 *Rumex sp.*, Dock.
c46 *Raphanus Raphanistrum*, Wild Radish.
47 *Sonchus sp.*, Sow Thistle.
48 *Silybum marianum*, Virgin Mary's Thistle.
49 *Sida rhombifolia*, Sida Weed.
b50 *Stachys arvensis*, Stagger Weed.
b51 *Solanum nigrum*, Black Nightshade.
52 *Salvia Verbenaca*, Wild Sage.
53 *Stellaria media*, Common Chickweed.
54 *Silene Gallica*, French Catchfly.
c55 *Sisymbrium orientale*, Oriental Rocket.
56 *Spergula arvensis*, Corn Spurry.
57 *Stipa sp.*
58 *Tribulus terrestris*, Bulls Head, Caltrops.
59 *Tricholæna Teneriffæ*, Red Natal Grass.
c60 *Tagetes glandulifera*, Stinking Rodger.
61 *Verbena sp.*, Purple Top.
62 *Vicia sp.*, Wild Tare.
63 *Xanthium spinosum*, Bathurst Burr.

a Poisonous. *b* Suspected poisonous. *c* Impart a bad flavour to butter.

TABLE III.

GERMINATING CAPACITY AND PURITY OF THE PRINCIPAL SEEDS IMPORTED INTO QUEENSLAND DURING 1921-1922.

—	Imported from—	Percentage of Samples Germinating Between—								Standard of Germination prescribed by the Pure Seeds Acts.	Standard of Purity not more than 2 per cent. Inert Matter, 1 per cent. Weed Seeds. Percentage of Samples up to prescribed Standard.
		100-90.	89-80.	79-70.	69-60.	59-50.	49-40.	39-30.	29-0.		
		%	%	%	%	%	%	%	%	%	%
Beet	Holland, England, U.S.A.	..	8·8	38·2	35·3	11·8	5·9	..	..	55	100
Beans, Lima	U.S.A.	60·0	40·0	..	..	..	..	..	..	75	100
Beans, Broad	New Zealand, Holland	100·0	..	..	..	..	..	..	..	75	100
Beans, French	U.S.A., New Zealand, Holland	84·2	10·5	5·3	..	..	..	..	..	75	100
Beans, Mauritius	Fiji	100·0	..	..	..	..	..	..	..	75	100
Cabbage	Holland, England, U.S.A.	27·6	57·6	12·7	..	2·1	..	..	..	65	100
Cauliflower	Holland, Italy, England	35·7	21·5	35·7	..	7·1	..	..	..	60	100
Carrot	Holland, England, U.S.A.	..	17·2	13·8	34·5	20·7	6·9	..	6·9	55	100
Cucumber	U.S.A., England, Italy	58·8	29·4	5·9	..	5·9	..	..	..	70	100
Leek	U.S.A.	..	..	66·7	..	..	33·3	..	..	50	100
Lettuce	U.S.A., Holland, England	70·8	16·7	8·4	..	4·1	..	..	..	65	99
Mangel	Holland, England	14·3	19·1	9·5	47·6	9·5	..	..	..	55	100
Melon	U.S.A.	16·7	58·4	13·9	2·8	5·5	2·7	..	..	65	100
Onion	New Zealand, England, France, U.S.A.	15·4	46·1	15·4	7·7	7·7	..	..	7·7	60	100
Peas	Holland	100·0	..	..	..	..	..	..	..	80	100
Parsley	Holland, U.S.A.	..	..	33·4	33·3	..	..	33·3	..	50	100
Parsnip	Holland	..	..	..	..	50·0	..	..	50·0	30	100
Radish	Holland, England, U.S.A.	34·8	17·4	34·7	13·1	..	..	..	..	60	99
Swede	Holland, England	33·3	40·0	26·7	..	..	..	..	..	65	100
Sweet Corn	U.S.A.	28·6	57·1	14·3	..	..	..	..	..	75	100
Tomato	U.S.A., Italy	5·9	47·0	35·3	11·8	..	..	..	..	65	100
Turnip	Holland, England, U.S.A.	65·4	26·9	..	..	7·7	..	..	..	65	100
Tobacco	U.S.A.	..	..	50·0	..	50·0	..	..	..	50	100
Hemp	Japan	Imported for feeding purposes—Purity ranging from 95 to 98 per cent.									
Linseed	New Zealand, Japan										
Millet, Red French	Japan										
Millet, White French	Japan										
Rape	Japan										

THE STOCK FOODS ACT.

Under section 3 of the Act every wholesale seller of such foods as bran, pollard, calf meal, poultry meal, or other mixed, concentrated, or perpared stock foods is required to send in each year, before the 31st of January, a sample, statutory declaration, specimen invoice, and label which is to be affixed to every package. To explain the requirements of the Act, circulars were mailed last December to every known wholesale seller within the State.

Samples of bran and pollard were taken from the various vendors or delivered in accordance with section 3 of the Act, a portion of each sample being sent to the Agricultural Chemist for chemical analysis.

For purposes of comparison, the following table gives the chemical analyses of the Queensland and Southern products:—

—	Manufactured in					
	Queensland.			Southern States.		
	Crude Protein.	Crude Fat.	Crude Fibre.	Crude Protein.	Crude Fat.	Crude Fibre.
	%	%	%	%	%	%
Bran—						
Average ..	16·2	4·2	10·0	15·0	3·0	10·4
Maximum ..	18·1	4·6	10·6	16·6	4·0	12·4
Minimum ..	14·8	3·8	9·2	14·4	2·0	8·3
Pollard—						
Average ..	16·1	3·6	5·6	14·9	3·3	7·9
Maximum ..	17·3	4·1	7·2	16·2	4·4	10·3
Minimum ..	15·4	2·6	4·3	14·3	2·7	4·5

Time has not permitted of a thorough microscopical examination of the samples. Traces, however, of *Lolium temulentum*, *Avena fatua*, *Brassica sinapis*, and other weeds were found in many of the brans, and in several instances the so-called pollards were not true pollards within the definition of the regulations. These remarks apply to both Southern and Queensland products; the latter, it will be noted from the above table, are of better average quality.

Vendor's Guarantee.

In many instances both meals and calf foods have not been up to the vendor's guarantee. In most cases the manufacturer has altered the label and reduced the figures given for protein or fat and increased that of fibre. The regulations under the Act do not prescribe a standard, but it is compulsory on the vendor to attach a label stating the minimum amount of crude protein and crude fat, with the maximum amount of crude fibre. The vendor therefore makes his own standard, and it is but reasonable to expect the vendor's goods to be up to his own guarantee.

The Farmer as a Consumer.

The farmer is not only the producer of the wheat or other grain, but the largest consumer of the various by-products; it therefore follows that he should have more than a passing interest in the quality of the foods purchased, the feeding value of which will improve as the buyers become more critical. Millers and other manufacturers are not wholly responsible for the weed-seeds and foreign matter of like nature that is found in stock foods; the root of the trouble is the farm where the grain or chaff was grown.

Exact Definitions Desired.

Several complaints were received from merchants regarding oats purchased from the Southern States. One sample contained over 11 per cent. of weed-seeds; another over 6 per cent. of weed-seeds, and nearly 5 per cent. of other foreign matter. It is to be regretted that both buyers and sellers base the so-called grades on general opinion, which is influenced by a rising or falling market. The same remarks apply to chaff; the words "prime" or "good and sound" are absolutely meaningless unless based on an exact definition. The words "reasonably free from foreign matter" do not imply any definite quality unless the amount and kinds of foreign matter are expressed on a percentage basis with the total prohibition of any substance deleterious to life or health of stock, such as *Ricinus communis* (castor-oil beans).

A Typical Instance.

A typical instance of deleterious matter occurred last August, when several trucks of chaff were found at Toowoomba, Brisbane, and Maryborough containing a large amount of *Datura stramonium* seeds. Fortunately the sales were stopped before any serious damage occurred. None of the merchants handling this line could at the time identify *Datura*, the presence of which the grower of the chaff is responsible for.

Every effort has been made to give the fullest possible information to any produce merchants or storekeepers desirous of obtaining a fuller knowledge of these impurities. The majority of vendors, however, are inclined to trust to their luck and ready wit when an officer makes an occasional visit to their store.

QUEENSLAND STOCK IN 1922.

BY MAJOR A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

Abstracted from the Annual Report of the Under Secretary for Agriculture and Stock (Mr. Ernest G. E. Scriven) to the Minister (Hon. W. N. Gillies) for presentation to Parliament.

Stock Statistics.

The following figures supplied by the Government Statistician show an increase in horses, cattle, sheep, and pigs as compared with the previous year:—

Year.	Horses.	Cattle.	Sheep.	Pigs.
1921	742,217	6,455,667	17,404,840	104,370
1922	747,543	7,047,370	18,402,399	145,083
Increase	5,326	591,703	997,559	40,713

It is satisfactory to note the increase in the number of stock. There has been a general depression in the cattle industry owing to the low value of stock, and until oversea markets are established, there seems little likelihood of any permanent improvement. The sheep industry is in a much more satisfactory position, owing to the enhanced value of merino wools and mutton.

Horses Exported.

Eight hundred and seventy-six (876) horses were exported oversea, of which two hundred and eighty-two (282) were mares.

Examination of Stallions.

Examinations were held at the following places:—Brisbane, Laidley, Esk, Lawnton, Townsville, Beenleigh, Gympie, Nambour, Warwick, Goomeri, Kingaroy, Nanango, Dalby, Killarney, Georgetown, Gatton, Boonah, Lowood, Bundaberg, Rockhampton, Caboolture, Beaudesert, Toowoomba, Ipswich, Marburg, Mackay, Charters Towers.

Eighty (80) stallions were examined, of which number six (6) or 7.5 per cent. were rejected.

Tabulated results of the examination are as follow:—

	Draught Horses.		Blood Horses.		Light Horses.		Ponies.		Totals.	
	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.	Number Examined.	Number Certificated.
	16	15	20	17	21	19	23	23	80	74
Defects.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.	Number Rejected.	Percentage Rejected.
Sidebones ..	1	6·25	..	..	..	..	..	..	1	1·25
Spavin	..	..	1	5·00	2	9·52	..	..	3	3·75
Curb	..	..	1	5·00	..	..	..	..	1	1·25
Want of type and conformation	..	..	1	5·00	..	..	..	..	1	1·25
Totals ..	1	6·25	3	15·00	2	9·52	..	..	6	7·5

Analytical Examinations.

Forty-nine (49) samples of viscera and contents were submitted to the Agricultural Chemist for analysis, and in twenty-two (22) cases poison was detected. In North Queensland twenty-three (23) samples were examined, of which fifteen (15) contained poison.

Interstate Conference.

A conference of the chief veterinarians and stock officials of the different States were held in Sydney in April last. The following subjects, among others, were dealt with:—

Uniformity with regard to stock and stock disease legislation.

The adoption of a uniform schedule of diseases of animals throughout the States.

That each State should undertake an educative campaign with the object of eliminating and eradicating pleuro-pneumonia contagiosa from Australia.

The diagnosis and control of swine fever and the restriction of interstate traffic in pigs.

Control of the cattle tick and the effect of cattle tick on interstate traffic.

Control of sheep louse and sheep tick.

The disposal of actinomycotic, tubercular, and cancerous cattle.

Conditions governing the export of cattle to Java and other countries.

Rabbit and vermin suppression.

Railways and their importance in suppressing the spread of animal diseases.

Certification and registration of stallions,

The passage of legislation governing the veterinary profession.

Consideration of the form of certification and notification in connection with interstate traffic in stock.

TICK BOARD.

Suppression of Tick Pest.

The activities of the Board have, during the year under review, been increasingly directed to the suppression of the tick pest in areas where sporadic outbreaks have occurred, and in the minimisation of the pest in the heavily tick-infested territory; also to the prevention of an extension of the present infested areas of the State.

It has been noted with satisfaction that stockowners generally are becoming more alive to their responsibilities, and efforts to secure their co-operation have been attended with more success than hitherto. It is obvious, however, that unless this co-operation is directed systematically, there is little hope that the objects of the Board can be fully achieved.

The local authorities throughout the State, with isolated exceptions, do not exhibit that practical sympathy which would be expected in efforts made to deal with the tick pest.

Stock Movements.

In the earlier portion of the year stock movements, especially in Northern areas, were considerably reduced owing to the fact that meatworks were not operating, but the traffic on routes converging on the Queensland Northern Railway is now very heavy.

Cattle have from time to time arrived at Julia Creek from Gulf areas in a heavily tick-infested condition, and the attention of those interested has been drawn to the necessity for dipping at the Government dip at Donor's Hills prior to further movement in a southerly direction. A subsequent dipping from seven to ten days prior to arrival at centres on the Queensland Northern Railway should also be arranged for, and if effective, this would permit stock to cross to centres south of the railway on one further dipping.

Large mobs of cattle have during the past year travelled through the Burnett areas to the Darling Downs, and dipping at Jarrah, Durah, and Boondooma, prior to entry on to the Downs, has been enforced in the interests of stockowners in the clean areas south of the Main Range. Owing to the difficulty in securing effective supervision by a permanent officer at Boondooma, the Burrandowan dip was commissioned for the cleansing of cattle travelling across the range *en route* to Jandowae and centres further south, but it may be possible to again use the Boondooma dip for that purpose when the services of an officer from the Kingaroy area can be detailed for supervisory duties.

Notwithstanding the close supervision and the application of restrictions on stock movements from tick-infested to clean country, it is regretted that an important extension of the area of infestation in Central-Western Queensland has occurred.

Tick-infested Travelling Stock.

In July, 1921, mobs of travelling stock from territory north of the Queensland Northern Railway were found tick-infested on arrival at Isisford after movement *viâ* Winton, Evesham, Maneroo, and Arrilalah. Immediate action was taken to ascertain, if possible, the source of infestation and to return the infested cattle on the route

travelled, and thence to Aramac for dipping. Exhaustive inquiries indicated that the cattle were clean on arrival at Winton, and as certain cattle depastured at Baratria, on the Winton-Maneroo route, were found infested, there is no doubt that these stock were responsible for the trouble. Every precaution was taken to prevent stock movements on or across the infested route until dipping facilities could be provided by stockowners or local authorities interested. The co-operation of the shire councils at Isisford and Blackall was sought and obtained to deal with spraying operations at those centres, and additional inspectors were detailed for duty at Isisford, Blackall, and Jundah. It was necessary to extend cleansing operations to Blackall in view of the fact that holdings on both sides of the Barcoo River were found infested. Stock from Northern areas for the south, travelling *viâ* Winton, were deviated at Evesham, *viâ* Camoola, to Aramac, for dipping, and were thence permitted to travel *viâ* Barcaldine, Jericho, and Tambo, avoiding Blackall. Close inspections have been periodically made of the infested route, also of adjoining holdings and town reserve, but no ticks have been found for some months.

This indicates a possibility that the outbreak has been successfully coped with, but development during the ensuing summer must be awaited before this can be assumed with any degree of certainty. The restrictions, therefore, will apply, with the exception of a variation to permit fat stock for immediate slaughter, from holdings west of the Maneroo route, crossing that route direct to Longreach to the trucks.

The Board also decided recently that as there is no danger to be apprehended by the movement of stock *viâ* Blackall from Barcaldine, this route has now been opened, and cattle may travel through Blackall *en route* to Tambo and southern areas.

Regular dippings or spraying and inspections were carried out in centres on the Darling Downs, where sporadic outbreaks of ticks occurred during the previous year, and restrictions on movements of travelling stock in the Clifton, Pratten, Dalby, and Pittsworth areas have now been removed.

Unfortunately, in March last ticks were found on cattle at Yeulba, but as the route between the Main Range and the railway on which the infested cattle had travelled was found clean, it was not considered that infestation occurred from that source. Upon further inquiry, it was ascertained that some cows had been introduced from the Brisbane district. These cattle were dipped twice in approved dips and found free from ticks before permission was granted to truck for Yeulba, but the stock were not trucked for some twenty-four hours after dipping, as it was considered, until recent investigations proved otherwise, that dipping would prevent larval ticks from attaching themselves to animals for at least thirty-six hours after dipping. It has since been proved that larval ticks will attach themselves within eighteen hours, which probably occurred in this case. The infested cattle were periodically sprayed until clean, and all cattle on suspected holdings were mustered and crush-inspected, but were not found infested.

Isolated outbreaks also occurred at Macalister and Bowenville, but after necessary spraying restrictions had been periodically applied, and frequent inspections had revealed the fact that the infested areas were clean, quarantine restrictions imposed of the discovery of the outbreaks were removed.

Certain tick-infested cattle arrived at Jondaryan from the Boonah district in April last, but the ticks were noted immediately on arrival, and the cattle were returned to their original pastures.

The Railway Department has co-operated with the Board in respect of the disinfection of stock trucks, but until provision is made for the establishment of central depôts for that purpose it will be difficult to secure thoroughly effective results.

Helidon Cleansing Area.

The work carried out in this area has been attended with successful results. In January last a considerable portion was declared clean, and restrictions were removed. The area has been enlarged, as it was found necessary to extend the boundaries to conform with watersheds. By so doing, we now have included therein a large portion of rough, grossly tick-infested country adjoining Cressbrook Creek and the Anduramba road. The officer in charge of the area reports that infestation has been greatly reduced in these localities by frequent periodical dippings, and he anticipates that with the co-operation of stockowners, which is cheerfully extended, the majority of the infested holdings will be cleaned in the ensuing twelve months.

Holdings inspected	4,201
Horses inspected	10,165
Cattle inspected	152,327
Sheep inspected	158
Number of infested holdings	499
Number of stock dipped	46,188

South Burnett Cleansing Area.

As reported last year, the southern portion of this area, comprising about 1,280 holdings and aggregating approximately 220,000 acres, has remained clean, with the exception of sporadic outbreaks caused by the passage of certain tick-infested stock. Although precautions were taken to prevent infested stock gaining admission to the cleansing areas, it is found practically impossible at times owing to irregularities on the part of owners of travelling stock.

An officer has been stationed at Wondai for a considerable period to prevent the introduction of tick-infested stock from the northern portion of the gazetted cleansing area, and also to supervise the dipping of stock grazing on the northern boundary. It has been decided that the present southern portion of the cleansing area is a sufficient buffer to the clean country on its southern boundary; therefore, the cleansing work will not be continued in the northern portion, but operations will be extended in a westerly direction to include the parishes of Durong and Boondooma, which will link up this area with the Miles-Chinchilla area.

Holdings inspected	832
Stock inspected	65,107
Infested holdings	207
Stock dipped	41,151

Miles-Chinchilla Area.

During the early portion of the year under review repeated applications were made for the removal of restrictions applicable to this area. After full reports had been received from the officer in charge it was decided to release the greater portion of the area from cleansing operations. However, in view of the possibility of infection due to the movement of tick-infested cattle to Chinchilla, it was decided that action for the release of the south-eastern portion of the area should be deferred until there is evidence that no danger is to be apprehended as a result thereof.

Holdings inspected	531
Stock inspected	41,150
Infested holdings	—
Stock dipped	—

South Coast Area.

Regular dipping of stock was carried out in the Coolangatta town area. It was not considered expedient at present to extend operations to the other portion of the proclaimed area, which extends to the Logan River. Straying stock on roads at Tugun were dipped as a precaution against their surreptitious entry into the Coolangatta town area. Notwithstanding the precautions taken, stock were found tick-infested in the Coolangatta area in the months of March and April last.

Dips.

The total number of dips registered in the State totals 4,163, as compared with 3,976 last year.

Particulars of dips registered in the various stock districts are as follow:—

District.	Number.
Barcaldine	3
Bowen	205
Brisbane	1,047
Cairns	202
Clermont	53
Cloncurry	40
Cooktown	39
Gladstone	323
Hughenden	34
Maryborough	1,290
Normanton	32
Rockhampton	446
Roma	43
Springsure	60
Toowoomba	93
Townsville	217
Warwick	34
Winton	2
Total	4,163

Dipping Fluids.

One thousand one hundred and fifty samples of dipping fluids were analysed, viz., 612 from Southern and Central Queensland, and 538 in North Queensland. As reported previously, the regulation providing for the compulsory analysis of dipping fluids twice annually is not enforced except in proclaimed cleansing areas or in cases where dips are recognised by the Department for the cleansing of stock prior to movement into tick-free country. In these cases it is found necessary to regulate intervals between the analyses of dip fluids to conform with the number of stock dipped or the addition of fresh concentrate. The portable testers supplied to stock inspectors have been found most useful for field tests, more particularly in isolated centres where samples could not be analysed for a considerable period. No less than 52 pints of standardised iodine solution was supplied to the various inspectors by the agricultural chemist.

DISEASES IN STOCK.

The members of the veterinary staff have made 356 visits to various centres in Southern and Central Queensland (Appendix I. deals specifically with North Queensland). The distances travelled in many cases were very great, as can be readily understood when the size of this State is considered, but much useful knowledge has been disseminated and practical aid given to numerous stockowners. The testing of cows for tuberculosis was carried out free of cost, but prior to the test the consent of owners was obtained in all cases for the destruction of animals which reacted. The health of stock generally has been good, and no outbreaks of any new infectious diseases were noted. Cases of poisoning were investigated in several districts, due in most cases to poisonous vegetation. Cases of arsenical poisoning were also investigated, and were chiefly associated with the destruction of prickly-pear. In most instances stock were not removed from the paddock while the work of destruction was in progress, with the inevitable result that the animals consumed the poisoned pear. Treatment in many cases was impracticable, as the animals were unaccustomed to being handled. With quiet cattle the administration of moist peroxide of iron has been found very successful. The only practical method of dealing with these cases is to remove stock from the paddocks where pear is being treated, or by eradication of the poisoned pear before stock are allowed to graze in the paddocks.

Mycotic Poisoning.

In a few instances mycotic poisoning came under notice, due to the growth of moulds on dry grasses, following a propitious season. The cutting of the natural grasses for conservation as hay or silage is undoubtedly a precaution against mycotic poisoning, and also serves as an asset in drought periods, although an impression has gained ground that the natural grasses are useless when conserved for fodder. If the fodder is used as hay, or cut into chaff, and is sprinkled with a mixture of molasses and water, which adds to the digestibility and palatability, it is a very wholesome and desirable article of food, on which stock do well for considerable periods. The molasses acts to a slight extent as a corrective to fungi poisoning, in that it assists a healthy and normal bowel action.

Pleuro-Pneumonia Contagiosa.

Seventy cases of this disease have been reported, as compared with sixty-six last year. The usual quarantine of three months after successful inoculation has been enforced. It was resolved at the Interstate Conference held in Sydney to reduce the quarantine period to two months.

So-called Caterpillar Plague Affecting Cattle.

Early in July information was received from the Roma District that large numbers of cattle had died and that others were sick, the result of eating so-called caterpillars.

The District Inspector of Stock, Roma, was wired to for confirmation of the news, but before receiving his reply, Mr. Armstrong (officer in charge of the Soldiers' Settlement, Gunneview), reported that losses of stock were occurring on Westgrove Station, about 100 miles north of Roma, and arrangements were at once made to personally visit Westgrove. Mr. Harding, the manager, very kindly placed his motor-car, horses, and men at our disposal, and, although we rode over Westgrove, and made inquiry from adjoining stations, we were unable to find a single sick case suitable for examination. A number of carcasses were noticed lying about on Boxvale, but decomposition had advanced too far for an examination to be made. It was estimated that fifty or sixty deaths had occurred out of 900 animals. So far as can be ascertained we have nothing on record showing the actual cause of death when cattle eat caterpillars. Personally, I was of opinion that it was caused by the grubs setting up a mechanical irritation of the mucous membrane of the stomach and bowels, but from information obtained at Westgrove it is now

considered that death is probably due to a poison contained in the grubs. The treatment of affected animals can only be attempted in small herds, such as those on dairy farms, where the animals are regularly handled. Daily doses of raw linseed oil (½ to 1 pint), followed every four to six hours with 1 quart of linseed or oatmeal gruel, the white of two eggs, and 2 oz. of sweet spirits of nitre, were reported to have been successful in several cases.

The prevention of the pest appears to be an entomological question, and was therefore referred to the Government Entomologist. At present owners of large herds are practically helpless, and can only remove their cattle from paddock to paddock, according to the development of the pest in the various paddocks. It was pointed out that ringbarking was of little service, because for each tree destroyed numerous suckers grow up, which make even greater feeding ground for the grubs.

Mr. Harding and Mr. E. C. Alexander (head stockman on Westgrove) supplied the following information:—

History.—The affection was first seen on Westgrove in 1908, when deaths were attributed to cyanide poisoning, used for killing opossums. In 1913 similar caterpillars or grubs to those now on the station were seen, and large numbers of animals, chiefly weaners and heifers heavy in calf, died. About ninety-eight were found dead in one small area. The grubs are chiefly noticed in wet seasons, and do not disappear until warm weather sets in. Trees attacked by grubs are confined to the narrow-leaf ironbark, silver or broad leaf ironbark, young spotted gum, box, and small currajong.

Symptoms.—Animals appear dull, and exhibit the following brain symptoms:—Will readily charge, have peculiar gait, quivering of the muscles, die without struggling, and sickness only noticed for about two days.

Post Mortem.—The blood is very dark in colour, connective tissue is dark, and putrefaction present at time of death, particularly around neck. Lungs are enlarged and pale in colour, pleura easily detached. Stomach contains blackish-coloured fluid, but the mucous membranes are normal in colour, petechial spots on the peritoneum. The liver in some cases is enlarged and dark in colour, with an appearance when cut into as if it had been pin-pricked. The gall is normal.

A full report dealing with the particular grub referred to has been issued by the Government Entomologist.

Supposed Gidyea Poisoning.

It was reported in May last by Inspector Comiskey, of Urandangie, that cattle were dying in that district, apparently from eating gidyea. Losses generally occur when the trees are in pod and when green feed is scarce. The pods, after falling to the ground, are readily eaten by cattle, hence the suspicion that they are the cause of the trouble. After rain, when grass and herbage are available, deaths are not noted, although the pods appear to be as plentiful as previously. It was stated that cattle were dying when the report was submitted, but that no pods were on the trees, and, owing to the dry season, green feed was not available. The inspector, after investigating the cause of death for some weeks, was of opinion that it was due to the cattle eating the green leaves, especially those of the very young or stunted shrub-like gidyea, which was then plentiful. In 1919 feeding experiments were carried out at Roxburgh, with pods and leaves of the mature gidyea, with negative results. At the same time cattle were dying, probably from eating the new leaves of the young or stunted gidyea.

Contagious Abortion.

This disease has existed in the State for many years, but, according to official reports, not to any great extent. Although much has been written concerning this affection, and numerous experiments have been carried out for many years in various parts of the world, it appears from latest reports that much has yet to be learned, more particularly with regard to the best methods of elimination and control. A living vaccine is now used successfully in affected herds in various parts of the world. It has been suggested that animals are immune to the disease only whilst they carry in their system the living abortion bacilli. Therefore, to control the disease by this method all the breeding herd would have to be vaccinated annually for at least two or three years. The bull should not be allowed to animals for at least two months after their vaccination, by which time immunity takes place before pregnancy occurs. Contrary to previous ideas, recent research work indicates that the bull is seldom responsible for the spread of the disease. By means of the agglutination test, which, however, is not absolutely infallible, it is possible to detect infected animals which carry the organism, but few farmers are prepared to divide and maintain their herds in two distinct lots—viz., infected and non-infected animals. Further, it would involve the employment of special

attendants and the exercise of isolation precautions. Whilst thoroughly appreciating the serious financial loss entailed by an occurrence of this disease in a dairy herd, and the necessity for the most strenuous endeavour to limit its spread, there is still one phase of the subject that must be borne in mind: Statistics prove, in so far as they are available, that the majority of affected cows acquire a measure of immunity, and that only a small percentage become sterile. Many cows abort only once, others frequently do so a second time, but seldom on a third occasion. By this means the very great susceptibility to fresh infestation is greatly reduced, and cows carry their calves the full period. Thus it appears that in a herd where the disease has become established the majority of cows are only what may be termed as clinically affected for a relatively short period. If all the cows were simultaneously affected, within a period of two years the majority would be immune and the breeding again normal, with the exception of the small percentage which had become sterile. But as under natural conditions all cows in a herd are not simultaneously affected, the disease gradually spreads, and some years may elapse before the herd generally has acquired immunity.

The advisability of slaughtering all affected animals has been suggested, but in view of the information detailed above such action would appear unnecessarily drastic, and if carried into effect would needlessly deplete the dairy herds of the country, as well as entail serious financial loss, with no guarantee that the disease would be exterminated.

Tuberculosis.

During the year under review the tuberculin test was applied to 381 animals, as compared with 280 in 1921 and 160 in 1920. The number of positive reactions was 30, whilst 10 were doubtful and will be retested. Of the animals tested 130 were owned by Government departments, 212 privately owned, and 39 were subjected to the test prior to exportation.

The advantage to dairymen and other cattle-owners of application of the test free of any cost is gradually being appreciated. Many owners now realise that, apart from the public health point of view, it is most unprofitable to keep diseased animals running with healthy stock; but there are others who, through gross ignorance, will not voluntarily free their herds from this most infectious and insidious disease. It is intended to as far as possible utilise the services of the Veterinary Staff for the inspection of dairy cows supplying milk to our larger cities. At the present time, unless owners make application for the test to be applied, only suspected animals are tested. Some years ago it was suggested that dairymen who maintained their dairy herds free from tuberculosis by regular tests carried out by Government veterinary surgeons should be allowed some distinguishing mark on their milk carts, or perhaps a special coloured cart, which the public could easily recognise. It is considered that the general public would fully appreciate milk with a Government guarantee of freedom from this disease. If a few dairymen adopted this scheme, it is anticipated that it would be ultimately adopted by many others. Householders and others who may require milk for sick people, and more particularly for young children, would certainly prefer the guaranteed milk, even at a slightly increased cost.

Swine Fever.

Early in March one of the metropolitan meat inspectors reported that he had found lesions of swine fever in some pigs from the Boonah District, and his diagnosis was confirmed by the Veterinary Staff. The consignment consisted of twenty-nine pigs purchased from some nine different owners. Six carcasses revealed the typical lesions. An Order in Council was issued providing for the quarantine of all pigs within a radius of 12 miles from the Boonah Post Office. Although every effort was made to trace the source of infestation by thorough periodical inspections of pigs in the area, no definite information in that connection could be ascertained. As no further sickness was reported, the quarantine was lifted at the end of June.

Sheep.

The general health of the sheep has been good. For the last six months, owing to the drought conditions prevailing, parasitic diseases, such as the stomach-worm, tapeworm, and the blowfly pest, have not been seriously in evidence. With regard to the latter, it can now safely be said that important results have been obtained after years of experiments with various dipping mixtures and dressings. A simple, safe, and economical formula has proved very effective, which consists of 7 lb. of arsenic, 2 lb. soda ash, boiled in 100 gallons of water. This mixture is jetted into

the breech of the sheep at from 100 to 200 lb. pressure. The pressure varies according to the amount of wool on the animal. As females are attacked in the majority of cases, the treatment gives protection for about three months, at a cost of about one-fifth of a penny per head. Sheepowners may be assured that their ewes can be carried over the lambing period without the great losses, both of lambs and ewes, they have experienced in the past. Of course, other parts of the body are attacked, but it can be confidently stated that 90 per cent. of the attacks are in the breech. Experiments are now being carried out at Dalmally in the direction of finding a process or specific to protect the whole body. Another feature of jetting with arsenic is that a jetted sheep is a first-rate fly trap, in that enormous numbers of flies are killed.

Reports in regard to the nasal fly have been received from various districts. It is regretted that little can be done to ward off attack in view of the limited knowledge available. This pest, which is seldom responsible for the death of animals, lowers their vitality and makes them a prey to other parasites.

The Slaughtering Act of 1898.

The volume of slaughtering for human consumption has considerably increased during the year, as will be seen on perusal of the folowing comparative figures, compiled from the returns of permanent officers of the Department. The returns of police officers in country centres are not included:—

	1920-1921	1921-1922.
Bullocks	62,570 ..	79,268
Cows	15,605 ..	24,848
Calves	21,345 ..	27,018
Sheep	377,820 ..	465,731
Pigs	17,325 ..	21,977

In addition, 164,825 pigs were slaughtered at the various bacon factories. This increase has created a great deal of additional work for all inspectors, so much so that it is necessary to detail another officer for the metropolitan area. Many persons entering the trade required considerable information from inspectors concerning the erection and renovation of shops and slaughter-yards. Inspectors have been successful in their efforts to impress many of those who enter the business with the necessity for the equipment of their buildings in accordance with the standard required by the regulations. The low price of cattle has created a keen competition amongst the butchers, and in many instances stockowners have been compelled by force of circumstances to commence operations on their own account to clear off some of their surplus stock, and quite a number have purchased established businesses at a high cost. At the same time, owing to the low price of stock, illegal slaughtering has been prevalent in almost every district. Several flagrant breaches of the Act have been investigated, but few prosecutions instituted owing to the difficulty experienced in securing sufficient evidence to convict.

The annual return, supplied to the Government Statistician, of stock slaughtered up to the 31st December last in the Brisbane District, including Sandgate, North Pine, Wynnum, Manly, Cleveland, and Redland Bay, indicates the increase in the volume of consumption in that district, due mainly to the increased population and the low price of meat:—

Cattle slaughtered	46,809
Calves slaughtered	25,072
Sheep slaughtered	318,070
Pigs slaughtered	5,902

Returns of stock slaughtered for human consumption are now regularly received from police officers in 198 country centres, which show the following totals:—

Bullocks slaughtered	60,542
Cows slaughtered	28,648
Calves slaughtered	6,651
Sheep slaughtered	110,799
Pigs slaughtered	11,082

FRUIT FLY INVESTIGATIONS.

The Minister for Agriculture and Stock (Honourable W. N. Gillies) has made available the following Progress Report, No. 8, for the months of December-January, 1922-23, of the Entomologist stationed at Stanthorpe (Mr. Hubert Jarvis).

FRUIT FLY.

The Adult Fly.

During the last two months the numerical strength of the fruit fly (*Chætodacus tryoni*) in the Granite Belt orchards has been considerably augmented. This fact is to be attributed mainly to natural increase, for, since its first occurrence therein was recorded on 17th November, 1922, there has elapsed ample time for the maturing of at least three broods of fruit flies, to carry on the work of infestation. Although undoubtedly doing much damage in certain localities, yet the fruit fly is not this season the scourge it proved itself to be last year; many orchards, in fact, showing an almost complete immunity from its attacks, and notably those orchards, the owners of which have adopted the only really satisfactory means of dealing with the pest, *i.e.*, that of the careful gathering of all infested fruit, both on the ground and on the tree also, and the effective destruction of such fruit. If every single fruit grower in the Granite Belt area would co-operate in this work of cleaning up, it would go far towards establishing a practical control of the fruit fly in that district.

Trapping the Fly—(a) Personal Tests.

Fruit fly lures, now on the local market, have not (as personal tests would indicate) so far proved of material help in controlling the pest. Experiments with these lures have been very disappointing when such lures have been placed in trees bearing fruit. The fruit fly itself, while it is on the tree, is undoubtedly the attractive agent of primary importance, from the point of view of potency.

(b) Tests by Orchardists.

Better results in fruit fly capture have been obtained by placing lures in trees from which all fruit has been gathered. One or two orchardists have reported that they have, in this manner, found "Harvey's Fruit Fly Lure" successful in trapping both the male and female of *Chætodacus tryoni* (the so-called Queensland fruit fly), one such catch extending over a period of two weeks, resulting in 200 fruit flies, of which about 60 per cent. were females. These flies were caught in the well-known Japanese glass fly-trap, the trap being suspended from a branch of the tree, and not, as is the usual practice, placed on a piece of flat board, prized between two of its branches.

Repellants.

Creasote, coal-tar, and other substances are being tried as fruit fly repellants, but with, so far, negative results.

Poison Baits.

Experiments are also being made with poison bait sprays. For many years past various soluble and insoluble poisons have been tried as a possible means of controlling fruit flies, notably *C. capitata* (the Mediterranean fruit fly of New South Wales), *R. pomonella* (the apple maggot), *Dacus-cucurbitæ* (the melon fly). These poisons, that comprise arsenate of lead, Paris green, barium chloride, potassium arsenate, &c., dissolved or suspended in water, to which is added some sweetening agent, such as sugar, honey, or molasses, are applied to the fruit trees carrying fruit as a poison bait; and it is claimed that fruit flies, in comon with other insects, are attracted to, and feed on, one or other of these "poisoned sweets," and so perish prior to depositing their eggs on the fruit. The usual method of application is by means of some form of sprayer. In practice we have found that, where a large number of trees are to be treated, a power sprayer would be an advantage; but for a smaller number of trees an ordinary garden syringe answers the purpose admirably. The point aimed at is to get about 1 pint of the poisoned liquid evenly distributed in fine droplets over, say, each tree. This can often be accomplished by shooting it into the air close to the tree, when it will fall from above: it is, however, not necessary to adhere to this method. The spray can also be applied to one or two main branches only of each tree, thus avoiding fruit and foliage injury —a very important consideration when using such poisons as arsenate of potash and arsenate of soda, both of which are more deadly fly-poisons than arsenate of lead, but have a caustic-burning effect on the leaves and fruit of the trees if applied as a foliage spray.

A fruit fly bait originated by C. W. Malley (Entomologist, Pretoria, S.A.) and used by him for some years against the citrus pest (*Ceratatis capitata*, the Mediterranean fruit fly) has, it is claimed, proved successful in controlling it. The poison entering into "Malley's Fruit Fly Remedy" is arsenate of lead, in the proportion of 3 oz. to 4 gallons of water to which is added about 2½ lb. of sugar (or less of molasses if this be used).

Experiments are now being carried out in this district in order to test the efficacy of this and various other poison bait sprays, as a possible control of the Queensland fruit fly (*Chætodacus tryoni*); various tests will also be made of several methods of application. Personally, I do not altogether favour the method of sprinkling the bait over the foliage and fruit of the trees, for the reasons above stated, and also for considerations of economy. The method now being used in Spain and Italy against the olive fruit fly (*Dacus oleæ*), of applying the spray to special spray containers (Letviontes Compannette method), these being disposed amongst trees throughout the orchard, is proving there, and should prove here also, much more satisfactory, being undoubtedly cheaper, more deadly to the fly, and obviating all risk of foliage burning, &c. It is hoped that early next season a vigorous poisoning campaign will be in operation against the Queensland fruit fly. But this method of control, or partial control, will, as with all other measures that may be pursued, prove of little worth without the active co-operation of every orchardist in its adoption. This necessity for concerted action in the fight against the fruit fly is, I believe, realised by a large proportion of the growers: it has, in fact, already brought forth much fruit, insomuch as there is now a persistent effort on the part of the majority to clean—from the ground and from the trees—all fruit harbouring fruit fly maggots, and thereupon to effectively destroy it.

Fruit Fly in Grapes.

On 20th January, 1923, Inspector F. Becker brought to our office specimens of Black Hamburg grapes, harbouring fruit fly maggots; these grapes were taken from a vine growing at Rivertree, New South Wales. The maggots in question have since given rise to the mature insect—*Chætodacus tryoni*. There is no record to date of fruit fly occurring in grapes in the Granite Belt area, although this association is met with exceptionally in areas nearer the coast.

The "cleaning up" work now being carried out adjacent to our south-east border in New South Wales should prove of much benefit, not only to ourselves, but also to our neighbours resident there.

Parasites.

The fruit fly parasite (*Diachasma tryoni*) introduced by me into this district in March, 1922, has not so far been recovered, and it is proposed to secure a further supply of it from Brisbane in the near future.

A still more important parasite is, I think, the Chalcid wasp (*Syntosmosphyrum indicum*, Silvestri). This little wasp, a parasite of the Mediterranean fruit fly, attacks the maggot in the fruit, tracking it to the end of its burrow, and according to Newman (Entomologist, West Australia) laying as many as 12 eggs in each maggot; he also states that the insect is very prolific laying upwards of 200 eggs. Should it be possible to introduce and acclimatise this little wasp in the Granite Belt orchards, it ought—on this being realised—to prove a control measure of importance, and an effort to bring about this introduction should—I think—be made.

OTHER INJURIOUS INSECTS.

Wood-boring Weevil—Orthorhinus cylindrirostris.

Grape vine cuttings harbouring the larvæ or grubs of the elephant weevil (*Orthorhinus cylindrirostris*) were brought to this office. This weevil is quite well known as a minor pest of Citrus, and other economic plants in Queensland, and it has even been recorded boring through lead pipes (City Electric Light Co., Brisbane). The larva is a stout, fleshy, white grub, armed with strong sharp mandibles. When fully grown is measures just over ½ an inch in length. This is, to my knowledge, the first record of its attacking the grape vine in the Stanthorpe area. It is, however, an isolated case, and it does not appear that it will prove a pest of this plant of any significance. The beetle is quite well known to everyone; it has a long snout or trunk (hence its common name "Elephant beetle"), its front legs are very much longer than the others, and it has a habit of flying into rooms at night, attracted by lights.

Tomato Fly.

The maggots of this little shining green fly (*Lonchea splendida*) are often to be found now in ripe tomatoes, and being mistaken, under these circumstances, for the maggots of the fruit fly, *C. tryoni*, cause a great deal of alarm. This alarm is, however, unnecessary, the fly in question never (to my knowledge) injuring *sound* tomatoes, or any fruit. Its habit is to lay its eggs in some crack or injury present in the fruit, the surface of which has broken, or in overripe fruit. Its preference for injured tomatoes has earned it its name of "Tomato fly." It has also been bred by me from cucumbers and from melons. So far, I have no record of the Queensland fruit fly (*C. tryoni*) attacking tomatoes.

Tussock Moth—Orgvia postica, Liparidæ.

The caterpillars of this moth are causing a good deal of trouble in some orchards and private gardens by devouring the leaves of apple and plum trees, and also, too, the foliage of cultivated shrubs. The young larvæ, soon after being newly hatched, are about ¼-inch long, dark-brown in colour, and clothed with short hairs. They are gregarious (feeding together), connecting themselves to the leaves of the plant with fine silken threads. They grow to a length of about 1¼ inches, and are then curiously tufted with little bunches of long hairs; the two tufts at the end of the body being much longer than the others. The male moth measures about ¾ of an inch across the expanded wings, it is a smoky?brown colour, and remarkable for its comb-like antennæ. The female moth would ordinarily scarcely be taken for a moth at all, being wingless and merely a sack of eggs. It may sometimes be found crawling on the branches of the trees. The caterpillars being voracious leaf feeders should be fairly easily controlled with the ordinary codling moth arsenate of lead spray, *i.e.*, about ½ oz. arsenate to 20 gallons of water.

FUNGUS DISEASES.

(1) Apple Bitter Rot.

Specimens exhibiting this disease were forwarded to Mr. H. Tryon, Government Entomologist and Plant Pathologist, illustrating two instances of occurrence. He reports on them as follows:—

"I received in Brisbane yesterday (1st February) two apples (Rokewood var.) forwarded through Mr. H. Jarvis, Entomologist, as manifesting a disease giving him some concern so far as relates to the trees of the variety exhibiting it. This fruit affection of the apple is well known to me, the conspicuous sunken roundish dark blotches of decay, with little raised points disposed in concentric rings within them, being a very characteristic feature. It is a malady that is termed 'Bitter rot,' and one by no means confined to the variety on which it has occurred. It is, moreover, caused by a fungus named *Glœosporium fructigenum* in its present stage of growth in the fruit, and that in its final stage is named *Glomerella*—the latter being the resting one. It, in fact, not only occurs as a fruit disease as the specimens indicate, but also manifests itself, or may do, as a bark canker. These cankers commence as rounded or oblong sooty-black sunken spots, from one to several inches long, and presenting more or less ragged edges. These may occur in wood up to 3 inches in diameter; and ultimately the entire bark comprised in them is killed, as also the cambium and still deeper tissue beneath, with resulting fissuring lengthwise on the branch and tranverse cracks. Beneath some of the loose outer bark thus brought about an almost black encrustation may occur, and in minute cavities in this are found the fruiting organs, and spores of the *Glomerella*. With regard to the diseased fruit the little raised points are composed of innumerable massed oblong fungus spores, that, adhering together (*Glœosporium*—sticky spore), form a highly infective material, more potent than are the spores in the bark form of the fungus—*Glomerella*. Not only so, but the fungus long persists upon the apples or their drying up, and becoming mummified, and whether they remain on the tree or fall to the ground. However, the more permanent life of the parasite is in association with the bark. And thus, not only do apples become affected one from another by spores washed off by rain from diseased spots on to sound areas, but the apples may infect the bark (the cankers generally developing near where diseased fruit has been attached), and so the cankers, in which the fungus overwinters, originate fruit disease when the time arrives in its growth for infection to take place. In the case of fruit, the fungus attack commonly follows mechanical or other injury.

A consideration of these facts will suggest a line of treatment that obviously can only be of a preventative nature, such as the following:—

1. Remove from the trees all apples showing bitter rot, so also remove all mummified fruit on which it has occurred, and similarly gather all from the ground and burn the lot.

2. Similarly cut off and burn cankered wood or remove it with a scraper, painting Bordeaux mixture on the wound. The upper parts of the trees are where these generally occur.
3. Spray with Bordeaux mixture (4 lb. fresh lime, 4 lb. copper sulphate (bluestone), 40 gallons water) just before the buds open, and then from time to time until the fruit is full-grown or even commencing to ripen. (Note.—Arsenate of lead may be added to the Bordeaux mixture when treatment for codling moth has also to be prosecuted.) Care should be taken lest the Bordeaux mixture contain an excess of bluestone or rather any undecomposed, using a 10 per cent. solution of potassium ferrocyanide (yellow prussiate of potash) as a test in ascertaining its presence, if any.''

(2) Brown Rot—Monilea fructigena.

This fungus trouble affecting stone fruits is causing serious loss in the Granite Belt orchards, nor is the seriousness of the position fully realised by orchardists, who are unwittingly spreading the disease by allowing diseased fruit to remain on the trees and on the ground. It is quite common to see mummified fruit on the trees all through last autumn and winter, thus carrying the disease over to the next season. Under favourable (moist) conditions brown rot increases very rapidly, spreading destructively from tree to tree, and soon ruining almost the entire crop of peaches or plums. Energetic measures should be taken to control this disease, which attacks not only the fruit but the wood of the tree also. A late winter spray of bluestone (copper sulphate) and water used at a strength of about 2½ lb. to 40 gallons followed by a further spray in the spring before the blossoms open with Bordeaux mixture, 5:6:40 will probably be found helpful. It is important to destroy, by burning, all fruit and wood found to be affected with this serious disease.

FIELD WORK.

Visits of inspection to various parts of the district and experimental work in the orchards have, necessarily, during the last two months taken up a good deal of time. The insectary supplied by the Department is now completed, and will prove invaluable for carrying out under natural conditions many experiments hitherto impossible—or almost so—in the laboratory.

OFFICE WORK.

Numerous callers, letters, and general office-work have also, as in the past, claimed considerable time each week. It is anticipated that, as the fruit season closes, it will be possible to devote more time to insect life-history work, bearing on noteworthy pests, affecting deciduous fruit trees, or possibly vegetables.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist and W. D. FRANCIS, Assistant Botanist.

SOUTHERN GHITTOE (*Halfordia drupifera*).

This tree grows to a large size in the rain forests (scrubs) of the MacPherson Range, Blackall Range, and Imbil. Smaller trees or shrubs of the same species are often found growing in the sandy soils adjacent to beaches in places such as Southport and Coolangatta. The bark on the larger trees is somewhat wrinkled and inclined to be finely scaly. It is grey or yellowish in colour, and when cut is pale brown or yellow. The timber is yellowish-brown and very hard and heavy. It is extensively used now for making fishing-rod tips, as it is tough and fairly flexible. The North Queensland species, *Halfordia scleroxyla*, which is known as ''Ghittoe'' or kerosene wood, is very closely allied to the Southern tree, and upon investigation the two trees may prove to belong to one species, as the differences, if any, between them are slight. The larger Southern trees attain a height of about 100 feet and a barrel diameter of over 2 feet.

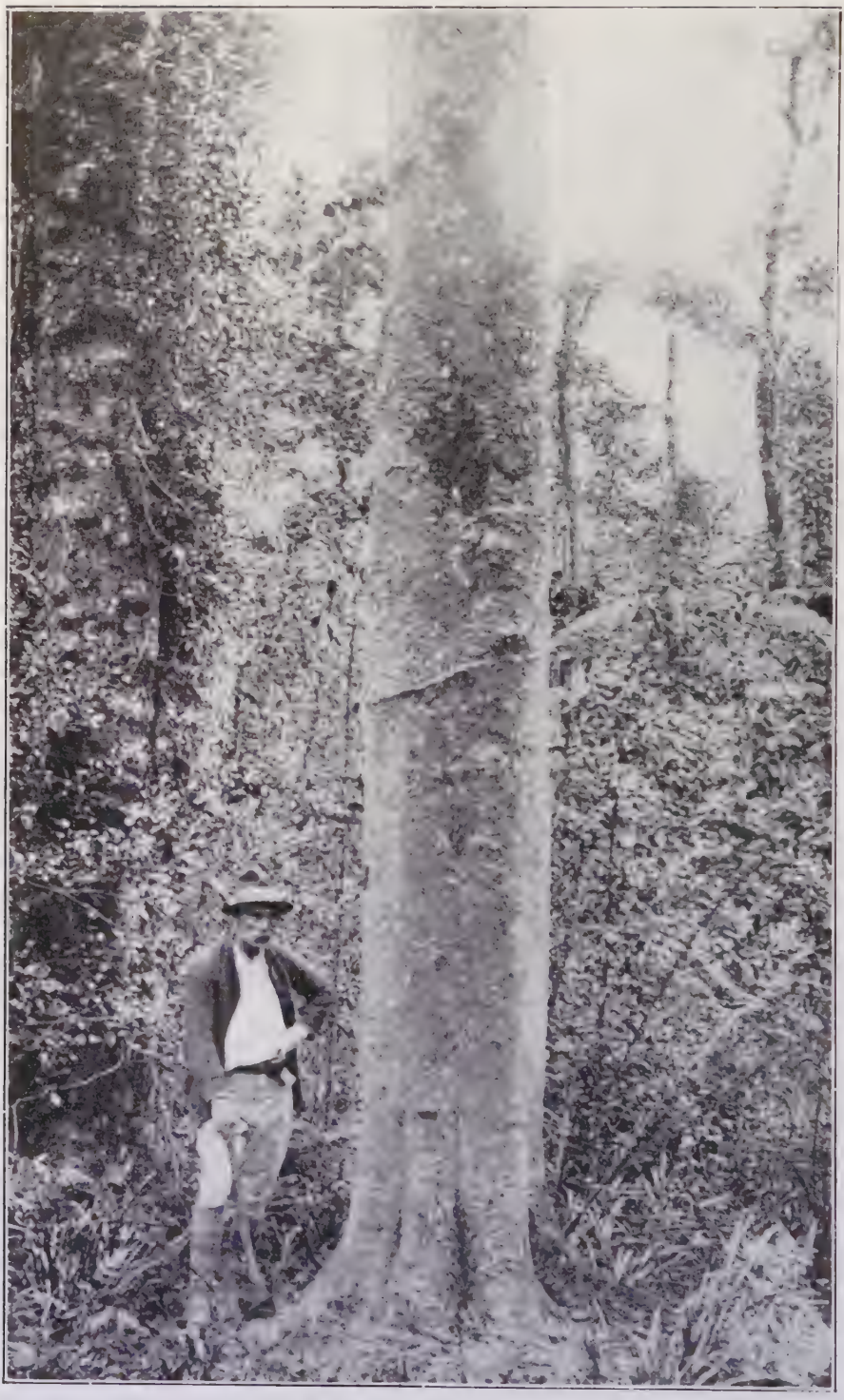

Photo. by the Authors.]

PLATE 43.—SOUTHERN GHITTOE (*Halfordia drupifera*).
A tree on Roberts Plateau, National Park, McPherson Range.

Photo : Dept. Agriculture and Stock.]

PLATE 44.—SOUTHERN GHITTOE.

NOTES ON THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

The cane sugar industry in Queensland, like many others, commenced on an insignificant scale early in the history of the then colony.

In 1849, proposals were made for the formation of a sugar company in South Brisbane, and there is said to have been a small plantation at Eagle Farm, on the Brisbane River, but apparently no sugar was made. Sugar-cane was cultivated in the gardens of several people in Brisbane about this time, and a considerable amount was also grown in the Government Botanic Gardens.

The first sugar made in Queensland of which there is any official record was manufactured by Mr. John Buhot in 1862. In 1863, Captain Louis Hope had 20 acres under cane on Ormiston plantation, near Brisbane, and that gentleman is generally conceded to be the father of the Queensland industry. The first sugar-cane plants were most probably imported from Java and Mauritius, and about this time the Queensland Acclimatisation Society took active steps in bringing over a large number of varieties. A tremendous impetus was given to the industry when land was made available for sugar-growing during some years by the Government, on remarkably easy terms, and in 1865 as much as 18,290 acres had been taken up for cane planting. Shipments of cane were this year also made to New South Wales farmers for planting.

The early stages of the industry were almost entirely devoted to the production of cane and the extension of land under cultivation. In 1866 so great was the demand that there was actually a scarcity of cane for planting. By the end of 1867 there were nearly 2,000 acres under cane and six mills had been erected, which between them manufactured 168 tons of sugar. There was, however, an insufficiency of mills, which caused heavy losses to the farmers, but millowners did well as they could buy cane for 4s. a ton.

Up to this time the industry had been carried on entirely in Southern Queensland, but it now began to spread to Bundaberg, Mackay, the Herbert and Johnstone rivers, and Cairns. It is in these places to-day that almost the entire output is manufactured, the extreme Southern districts making very little.

Sugar-growing continued to prosper, more land was brought under cultivation, and steam mills quickly superseded the antiquated cattle and horse-power erections. The production of sugar from 1870 to 1880 is given as follows:—1870, 2,854 tons; 1880, 15,681 tons.

During the next decade, 1881 to 1890, the production of sugar in tons varied from 16,660 to 68,924; and from 1891 to 1900, 51,219 to 163,734. During the period under consideration a large number of small mills were erected in most of the sugar-growing areas of the State as well as many large factories. On the decline of prices owing to the stimulation of bounty-fed sugar in Europe most of the small mills went under. During this time also a number of modern mills were erected under the Sugar Works Guarantee Acts with capital found by the Queensland Government. These were known as "Central Mills" and led to a further reduction in the small privately-owned mills. In 1901, there were some sixty sugar-mills in existence in Queensland.

From 1863 to the advent of federation in 1901, the sugar industry was almost entirely carried on by labour from the South Sea Islands. This class of labour, while eminently serviceable and of great use in opening up the country, was always distasteful to the majority of Australians, and when federation took place steps were taken to make the industry entirely a "white" one. This was accomplished by passing a measure prohibiting Kanakas entering Australia after 1904, and providing for the deportation of those who had already been engaged within a certain period. This only left some 2,000 Kanakas in Queensland, the majority of whom had resided for years in the State and had married. About the same time the Federal Excise Act came into operation, which provided for a protective duty of £6 per ton on all foreign sugar. An Excise duty was collected on sugar manufactured in Australia and a rebate was given to that in which white labour was used. These Acts have since been repealed. The years that have elapsed since federation have seen a further decrease of the small, uneconomic mill and a general increase in the efficiency and management of the larger surviving mills. This has been followed by the growing of better varieties of cane by the farmer and a general improvement in the tonnage of cane and sugar per acre by improved methods of cultivation. At the end of 1922 the number of sugar-mills was forty-two. This includes three new large and thoroughly up-to-date mills erected since 1913—viz., Inkerman, Babinda, and South Johnstone. The first of these is in the Lower Burdekin district, south of Townsville, and is the property of Messrs. Drysdale Brothers. The Babinda and South Johnstone mills have been erected by the Queensland Government to develop the rich tropical lands south of Cairns.

Sugar is grown in Queensland from the 28th to 16th degrees of latitude, the bulk being produced within the tropics. No difficulty is experienced in securing white men to undertake the work in field and mills at the high rates of wages now paid. Although conditions are somewhat trying in the North during the last two months of the year, yet the men are healthy, the death rate is low, and sunstroke rare. The general standard of the health of school children is considered good, and epidemics are stated by medical men to be attended by a lower mortality than in the Southern portion of Australia, and that with proper care the probability of children in the North living to adult ages is greater than in the Southern portion of Australia. It is considered that most prevalent cases of tropical complaints are preventable.

Sugar-cane belongs to the graminaceæ or grasses. Its botanical name is "*Saccharum officinarum*" but it is sometimes called "*Arundo saccharifera.*" It is considered by botanists that all the cultivated varieties belong to one species; but there are said to be strong reasons for the belief that there are more than one species.

These have been divided as follows:—

1. The kind known as "*Saccharum officinarum.*"
2. "*Saccharum violaceum,*" being canes with violet leaves of which we apparently had an example in this country in a cane introduced from New Guinea by Mr. H. Tryon, known as N.G. 64.
3. "*Saccharum sinese,*" Chinese cane. Stubbs says the chief specific difference is said to reside in the disposition of its panicle, which, unlike that of the "*Saccharaum officinarum,*" is oval and ornamental. Other divisions have also been made by botanists.

Varieties of cane naturally embrace slight to extreme variations. The variation between the two principal varieties grown in Queensland—viz., Badila and Demerara 1135—is shown in the following brief descriptions.

Badila or New Guinea 15.

A dark-purple to black-coloured cane. Stout sticks, with pronounced white waxy rings at nodes. Internodes usually 2 to 3 inches long but sometimes longer, especially in ratoon cane. Habit erect; foliage also somewhat erect and very green. Eyes generally full and prominent; trashes easily; sparse arrower. The foliage of very young cane has a slight reddish tinge; flesh white and highly saccharine; a remarkably heavy cane weighing 1 lb. per foot. Greatly appreciated by labourers, as it is so easily cut, trashed, and loaded.

Demerara 1135.

A brownish-red cane of moderate stoutness and a strong ratooner. Erect in habit, so that it is eminently suited for close planting. Joints about 4 inches long, parallel-sided. Foliage rather light in colour, sparse and upright. Arrows freely in the North.

From the beginning of the cultivation of the cane in Queensland it is estimated that quite 1,000 different varieties of cane have been introduced, while several thousand seedlings have also been raised. The number of varieties in commercial use to-day, however, may be stated to be about forty-five, but by far the greatest amount of cane grown consists of the two varieties, Badila and D. 1135, mentioned above. The former is the favourite on Northern cane areas, the latter in the South.

The chemical analyses of these two varieties, from a milling point of view, are as follows:—

Variety.	° Brix.	Sucrose in Juice.	Purity of Juice.	% Fibre.	% Commercial Cane Sugar.
Badila ..	23·0	21·96	95·47	9·62	18·20
D.1133 ..	19·47	18·06	92·70	11·00	14·50

Sugar-cane grows as high as 10 to 15 feet, but stalks as long as 27 feet have been measured. Some varieties are erect in habit, as are the two just mentioned, while others incline to "lodge" or assume a recumbent position when heavy, or they may be blown over by high winds. The roots are fibrous and lateral, and the majority of varieties are comparatively shallow rooters, but some are known as "deep-rooting" canes.

Photo: Dept. Agriculture and Stock.]

PLATE 45.—LOCOMOTIVE ON RUSSELL RIVER BRIDGE, BABINDA.

The stalk is cylindrical and is composed of what are known as "nodes" and "internodes." The nodes carry what are termed the "eyes" of the cane placed on alternate sides, and it is from these "eyes" that the cane is generally propagated. The leaves are alternate and opposite, and vary in length and width. The Badila cane has large, semi-drooping foliage, while the foliage of D.1135 is narrow and erect. The leaves clasp the stalk for some inches and then recede and when mature fall off, forming what is known in the canefields as "trash." When the cane plant is mature it throws up what is termed an "arrow" which develops a panicle of flowers. Within recent years the true seed of the cane plant has been discovered in the panicle, and the canes that have been grown from this seed are termed "seedlings." Cane does not arrow universally in Queensland; it does so far more frequently in the North than in the South, and there appears no doubt that climatic influences play a large part in the matter.

If a cane stalk be examined there will be found at the node several rows of dots. These produce the roots when that portion of the cane is planted in the ground.

In addition to the varieties introduced from other countries, a large number of seedlings grown from the actual seed in the cane have been raised by the Queensland Acclimatisation Society, the Colonial Sugar Refining Company, and the Bureau of Sugar Experiment Stations. As is usual in seedling work, few of these are of commercial value, but the seedlings that are successful compensate for the large number that have to be discarded.

Soils.

The land in Queensland used for growing sugar is included in a long, narrow coastal belt which is not continuous. Those parts which are suitable are separated from each other, often by considerable tracts of non-sugar producing country. The latter, owing to deficient rainfall or poorness of soil, are not utilised for cane. The sugar belt in Queensland is included between latitudes 16 deg. and 28 deg. South, but the bulk of the output is produced from Mackay north.

Cane soils vary considerably in character and composition. Cane as a plant demands an abundant supply of moisture, and so requires retentive soils. The open red porous soils of volcanic origin require frequent falls of rain to produce good crops of cane, and this, unfortunately, does not always take place in the rich soils of the Woongarra and Isis scrubs in the Bundaberg and Childers districts. The following classification of Queensland cane soils was made by Maxwell, a former Director of the Sugar Experiment Stations:—

District.	Soils.
Cairns	Partly shaly, sterile soils, but in the main deep, alluvial, sandy loams; also rich, red volcanic soils.
Mackay	Shaly in parts, with better alluvial over the lower levels; mixed volcanic and rich siliceous alluvial.
Bundaberg ..	Rich alluvial delta soils, interspersed with sterile soils and deep, rich, red volcanic soils.

The bulk of the sugar soils can be stated to be from good to rich alluvial, such as river flats and the deep red volcanic soils of considerable depth. The nature of the country is generally designated "scrub" and "forest." The North Queensland scrubs are really jungles, carrying a thick growth of what is known as scrub timber, such as silky oak, bean, pender, kauri, milkwoods, Johnstone River hardwood, interlaced with lawyer vine and other creeping plants, while the stinging tree is also conspicuous. Forest country usually consists of ironbark, bloodwood, Moreton Bay ash, bluegum, poplar-gum, and acacia.

Weather Conditions.

Hot, humid conditions are the best for the sugar-cane plant, and, fortunately, these generally obtain during the period of the maximum growth of the crop in Queensland. The wet season is usually synonymous with the three hot summer months of January, February, and March.

Although the weather is hot and humid during this period, the higher temperatures experienced in the drier belts of Australia are not common. A temperature of 100 degrees is rarely recorded. It is unusual for the thermometer to show much

above 90 degrees, even in the middle of summer. Indeed, during times of heavy rain, the weather becomes comparatively cool, but as soon as the sun reappears, the atmosphere becomes steamy and the growth of the cane is vigorously promoted.

On the coast of Queensland, where sugar is grown, the greatest rainfalls occur where the mountain ranges come close into the coast. Where they are considerably distant, as at Bundaberg and Ayr, the lowest precipitations take place. Consequently, the greatest amount of rain falls at Babinda and Innisfail, where the lofty ranges of Bartle Frere and Bellenden Ker are not far from the seaboard.

The following table shows the average annual rainfall in each of the sugar districts:—

District.	Average Annual Rainfall in Inches and Hundredths.	District.	Average Annual Rainfall in Inches and Hundredths.
Mossman	82·91	Proserpine	76·96
Cairns	90·49	Mackay	68·52
Mulgrave	81·91	Bundaberg	44·40
Babinda	165·00	Gin Gin	37·71
Innisfail	149·20	Childers	42·07
Ingham	80·53	Maryborough	46·14
Halifax	89·17	Pialba	38·04
Ayr	44·48	Nambour	60·93
Bowen	40·60	Beenleigh	48·87

Humidity

The mean relative humidity or percentage of moisture in the air is a most important factor in the growth of cane. The table hereunder gives the percentage of relative humidity in the principal coastal towns in the sugar districts at 9 a.m.:—

Place.	Percentage of Humidity.	Place.	Percentage of Humidity.
Bundaberg	69·0	Innisfail	80·0
Mackay	75·0	Cairns	70·2
Ayr	68·0		

Irrigation.

The climatic variations in Queensland from year to year are often so great that canegrowing is only certain in those districts possessing a high average rainfall. Districts with an average rainfall of 50 inches and under suffer exceedingly during dry spells, and irrigation would prove highly payable in such localities.

At the present time the only canegrowing district that uses irrigation water to any extent is the Lower Burdekin, situated some 40 to 50 miles south of Townsville. On the north side of the Burdekin River irrigation has been practised for a number of years, the plants used being the property of the farmers. Water is found at shallow depths, and is easily obtainable by sinking spearheads. On the south side of the river the Government have installed a complete system, which is available to growers of cane. Wells have been sunk and the pumps are electrically driven from a central power-house.

The cost of applying irrigation water on the Lower Burdekin is comparatively high, even though the most economical method is used. Consequently, there is a tendency to do with as little of it as possible, and, in many instances, to postpone the application if rain appears probable. This frequently leads to the suffering of the crop should rain fail to fall and the irrigation has not been carried out.

Water is not applied scientifically to cane crops on the Lower Burdekin, so that the greatest efficiency is not secured. This, however, is largely due to the high cost of application. The method of irrigation is to run the water in shallow furrows between the cane drills, usually made with the disc harrow known as the Cotton King Cultivator. The water is generally conveyed by fluming to the main ditch running on the headland at right angles to the cane rows. The water is then admitted to the channels between the cane, but as no attempt has been made to grade the land a great deal of water is often wasted.

In Hawaii the water is usually applied directly in the furrow or drill in which the cane plants are growing. The preparation of the land is more expensive, as it is laid out for irrigation according to the land contour, and the drills are cut into short sections so as to secure an even distribution. This method secures the largest economy of water. In the Queensland system, as practised at Ayr, it is not generally possible to evenly distribute the water over all the land, consequently some of the area goes short while other parts obtain too much. This system, therefore, involves the greatest waste of water, but is the cheaper as far as actual application is concerned. This is, of course, a vital point in the cultivation of cane in Queensland, where the costs of labour are so high. It is usual to only make one or two, or at most three, applications of water on the Lower Burdekin, but these are large in volume, running up to 6 inches.

In Hawaii, on the contrary, the applications are smaller, but far more frequent, ranging from the equivalent of half-an-inch of rainfall per week to 3 inches or more, as the crop makes greater demands upon the soil. These irrigations are carried on until the crop nearly reaches maturity; they are then stopped, so that the absence of water may have the effect of ripening the cane crop. With such a system the application of manures can be carried out in the most satisfactory manner, and the combined use of water and fertilisers renders the cane crops of Hawaii the heaviest in the world, while the production of sugar per acre is also higher than elsewhere.

As irrigation for cane must eventually play a large part in sugar production in the drier cane areas of the State, the matter will ultimately have to be taken in hand, so that the water may be applied in the most economical way, and no doubt the Hawaiian system, which has proved so successful, will be tried. It is a noteworthy fact that much larger crops can be grown with irrigation properly applied in dry areas than on lands where the rainfall is plentiful.

General.

During the past twenty years a great improvement has taken place in mill work, and the co-efficient of work and recovery of sugar is now much more satisfactory although there is still room for better work. The average tons of cane required to make a ton of sugar has dropped from 9.20 in the decade 1899 to 1908 to 8.68 in the decade 1909 to 1918, while in 1915, owing to the high density of the cane caused by a dry season, it fell to 8.2 and 7.76 in 1919.

The growing of sugar-cane in Queensland compares favourably with other countries when it is remembered that with slight exceptions it is carried on by a large body of small farmers (about 4,600) who do not possess the necessary capital to develop their farms in the same manner that the large millers of Hawaii and Java can do, with the added advantage in the latter island of remarkably cheap labour.

In Queensland, in favourable seasons in the North, 50 to 70-ton crops of plant cane are common, but the average is pulled down by the want of proper cultivation and fertilising in some instances, drought and frosts in Southern sugar districts, and the ratoon crops. The cane per acre of recent years has averaged about 18 tons, which is higher than it was some time ago. The varieties of cane in Queensland are, as a whole, better than in either Java or Hawaii, as they are higher in sugar percentage. Mill work in the best factories in Queensland is quite as good as elsewhere, but a number of mills require bringing up to date and their efficiency should be increased. This, at the present time, is a difficult matter, due to high price of materials.

Due to the recent awards made by the Arbitration Court in Queensland, the sugar industry in that State is probably the highest paid agricultural industry in the world. Australia is the only country in the globe that is attempting to grow cane sugar with white labour.

Apart from its great economical value, however, the sugar industry in Queensland possesses a far higher importance. In 1911, a Royal Commission on the industry was appointed by the Federal Government. This body sat for upwards of twelve months and collected a wealth of evidence in all parts of Australia, and its report was finally handed in at the end of 1912. It stated emphatically that the Queensland sugar industry was one of national importance, the maintenance of which vitally affected every citizen of the Commonwealth. By no other means at present visible can our vast Northern littoral be peopled and defended, and for this reason alone, apart from its enormous economic importance, it deserved the utmost encouragement and support that our Federal and State Legislatures can give it. The Commission have put this view in the strongest terms when they say—

"The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, of wealth, or of production; it is primarily and essentially a problem of settlement and defence. No nation can afford to regard lightly the development of its industries, the progress of its wealth, or the economic efficiency of

its productive machinery. But, important as these things undoubtedly are, they rank, as regards the sugar industry, on an inferior plane. The Commonwealth to-day is brought face to face with one of the greatest problems that has ever taxed the ingenuity of statesmanship—that of the settlement of tropical and semi-tropical areas by a white population living under standard conditions of life. And intimately associated with this problem is the question of national defence.

"If the ideal of a White Australia is to become an enduring actuality, some means must be discovered of establishing industries within the tropical regions. So long as these regions are unoccupied they are an invitation to invasion as well as a source of strategic weakness. Granted so much, it follows that the supreme justification for the protection of the sugar industry is the part that the industry has contributed, and will, as we hope, continue to contribute to the problems of the settlement and defence of the Northern portion of the Australian continent. The recognition of the nature of this supreme justification is the first condition of a sound public policy in relation to the sugar industry. Relatively to it all other issues are of minor importance."

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations has received from the Entomologist at Meringa, Mr. E. Jarvis, the following report, under date 14th February, 1923:—

Mortality Among Cane Beetles.

It will be of interest to record that a natural check of more or less severity on the increase of our grey-back cockchafer has been experienced this season as a result of the late spell of dry weather that marked the closing months of 1922. When the cultivation of plantations was resumed during the end of December many cane-growers ploughed up quantities of dead beetles that had been unable to escape from the dry soil. These specimens were probably the offspring of those which emerged at the beginning of November, 1921, the grubs from which—having pupated at an early date (July to August)—produced beetles in their subterranean pupal cells during September last. These specimens would not be able to remain alive underground in dry soil longer than about ten weeks, and consequently must have perished in December, before the dry spell broke up. However, grey-back beetles, as mentioned last month, have appeared in formidable numbers this season; those on the feeding trees at present being no doubt the offspring of specimens which emerged towards the end of December, 1921. If the first rain during this present season had fallen six weeks earlier (beginning of November), we should probably have had a very heavy emergence of grey-back beetles.

Breeding of Scarabæid Grubs.

Incidentally, while studying the imago condition of *albohirtum, frenchi,* and other cane beetles, attention this season is being given also to a few related species of root-eating scarabæidæ, the life-cycle of which has never yet been worked out. Although *Anoplostethus lætus* or *Calloodes atkinsoni,* for example, are not at present of economic importance, the grubs of these species may quite possibly at some future date make their appearance in cultivated land, or even gradually acquire a liking for roots of sugar-cane.

Para-dichlor. Experiments at Greenhills.

On the 17th instant a plot of Badila cane (August planting) measuring 66 feet by 264 feet was treated with ½-ounce injections of this fumigant, placed 7 inches deep, 1 foot apart, and from 4 to 6 inches from the stools. The work was done with special metal hand-injectors, invented by the writer for the purpose of administering this compound in dry crystalline form, and which were found to meet present requirements—viz., a simple way of burying the fumigant uniformly in a reasonable space of time—pending the subsequent invention of more rapid hand or machine appliances, which, however, would not be needed unless para-dichlor. realises expectations by proving an efficient fumigant.

It may be of interest to mention that the men who were injecting at Greenhills carried the crude crystals in an open 1-gallon tin, suspended at waist level by a strap passing over the shoulder. An occasional whiff from the openly-exposed fumigant gave them no inconvenience, being, in fact, rather pleasant than otherwise; and, moreover, owing to the method of application employed, they had no need to handle the crystals. Since reporting last month on the fall in price of para-dichlor.

to £4 per cwt., the Director has advised me that in all probability a crude form of this compound may be obtainable in the near future at a still lower price—viz., £56 10s. per ton.

Beetles on Feeding Trees (mostly of female sex).

Erroneous ideas with regard to the proportion between the sexes of our so-called grey-back cockchafer (*Lepidoderma albohirtum*) appear to prevail among cane-growers in the Gordonvale district. In order to obtain further reliable data on this question, 86 beetles were collected on the 19th January from fig-trees close to the laboratory, and when examined the results were—55 females, 31 males. Upon dissecting 50 of these females the development of eggs in the ovarian tubes were found to be as follows:—No., 17 beetles, no sign of eggs; No., 2 beetles, eggs had grown to $\frac{1}{8}$ natural size; No., 8 beetles, $\frac{1}{4}$ natural size; No., 4, $\frac{1}{2}$; No., 1, $\frac{1}{3}$; No., 8, $\frac{1}{2}$; No., 1, $\frac{4}{5}$; No., 1, $\frac{3}{5}$; No., 1, $\frac{5}{8}$; No., 3, $\frac{3}{4}$; No., 4 beetles, eggs natural size and fit for exclusion. On the 22nd January an additional 137 grey-back beetles were collected from feeding-trees close to the laboratory, and upon examination we found that 87 of these were females and 50 males. The above data indicates conclusively that collecting beetles from the feeding-trees adjoining headlands of canefields can be profitably carried out throughout the month following any big emergence of these cane beetles.

Tachinid Parasites of Cane Beetles.

An interesting experiment was undertaken this month to determine the percentage of grey-back beetles attacked by Tachinid flies whilst resting in feeding-trees during the day. On the 10th and 11th January 200 specimens were collected at random from trees near the laboratory, and each beetle placed in a cage of moist soil. Up to date (27th January) we have found 31 per cent. of these specimens to harbour dipterous parasites, in one case six Tachinid flies having been obtained from a single beetle. This parasite, which was first bred by us at Gordonvale in 1915, and slightly exceeds a-quarter of an inch in length, resembles in size and general form the common house-fly (*Musca domestica* L.), but is light brownish-yellow in colour, mottled irregularly with pale shades of buff on the thorax and hind edges of abdominal segments. The eyes during lifetime are conspicuous bright red, this colour, however, fading completely to brown an hour or two after death. Other species of Tachinidæ are expected to emerge a few weeks later, and full results in this connection will be reported next month.

Experiments with Aromas for Attracting Cane Beetles.

The possibilities of this fascinating method of control have been discussed by the present writer from time to time in various monthly reports, our first attempts in this direction having been made about eight years ago at Gordonvale Laboratory (''Queensland Agricultural Journal,'' vol. v., p. 169). As stated last month, evidence of positive chemotropism in *Lepidiota frenchi* Blackb. was obtained last month, details of such occurrence being as follows:—Whilst engaged in putting aromas in various bait traps hung to stakes placed about 200 feet apart on open forest country, the beetles of *frenchi* happened to commence their usual evening flight, which invariably takes place just before the advent of twilight. I was carrying at the time a tray of small bottles, some containing different aromas, while others had been emptied, although a drop or two still lingered around the mouth of these or on the corks, when suddenly, without warning, a dozen or more *frenchi* beetles flew on to the tray, buzzed about the bottles, and even alighted on my fingers, which previously had been wetted whilst pouring solution into traps already set. Although remaining on the tray for about a-quarter of a minute only, this was long enough to indicate that something had attracted them in the first instance. Possibly the movement of the tray as I walked may have caused them to fly off. The aroma in question was perhaps a combination of several different odours arising from the assortment of bottles on the tray, but was probably of a fugitive nature, since no further reaction of these beetles was noticed that evening. Subsequent exposures of aromas on the 1st January afforded additional encouragement, as *frenchi* beetles were found in four of the traps. In one case two females had been attracted, while another trap, containing water in which two chemical ingredients had been dissolved, had caught four beetles, all of the male sex.

The flighting season of the beetles is almost over here, although aromas are still being exposed at Riverstone, where the grey-backs are more in evidence. Up to the present (31st January) nearly 100 different aromas have been tried, but none of these have, so far, proved decidedly attractive to adults of *albohirtum*. However, we hope to be more fully equipped for this work next season.

At the present time we are making a special critical examination of the reproductive organs in both sexes of *albohirtum*, which, when studied from a bio-chemical standpoint may afford very material assistance in an investigation of this nature.

SUGAR CROP PROSPECTS.

The Director of Sugar Experiment Stations (Mr. H. T. Easterby), after visiting the Bundaberg and Mackay sugar districts early in February, stated that the continued absence of any regular wet season was giving rise to much uneasiness among farmers generally. Although good rains had fallen in both districts earlier in the year, these had not been followed up with further rains, and the cane, while looking well on the whole, had not made the growth usual at this time of the year. A good deal of the cane in the Bundaberg district was backward and some of it had a distinct yellow appearance. At Bingera the cane was more uniform and had a better appearance than immediately around Bundaberg. The cane on the Sugar Experiment Station at Bundaberg was also well forward.

In the Mackay district the cane was not as far forward as usual at this time of year, although there were some fine patches of cane visible of good growth and colour, there were other areas of some size that were not so well advanced and of a more or less yellow tinge. This appears in many instances to be due to faulty cultivation, and a sufficient endeavour has not been made to conserve moisture by providing a soil mulch with the scarifier. Far too much work has been done with the plough in the young cane, with the result that the capillary tubes in the soil have not been broken, but have been leading moisture to the air, whereby it is dissipated instead of conserved. No doubt farmers expected the wet season would have set in ere now, and its postponement is becoming a matter of some anxiety.

At the Mackay Experiment Station the cane is well forward, but some difficulty has been experienced this year with the green manure crops, owing to the presence of a small grub similar to that which affects the garden bean. This is the first time green manure crops have been so much destroyed as to render them useless for the purpose for which they were planted. These drawbacks appear to exist in the area immediately around the station, but have not been met with in the outside districts.

SUGAR: FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations has received the following report (5th February, 1923) from the Southern Field Assistant, Mr. J. C. Murray:—

Woongarra.

The cane in this area now looks remarkably well. Ultimate successful results, however, depend on what rain the farmers receive during the next two months, so that it is much too early as yet to forecast a successful crop or otherwise.

Growers on the whole have their holdings clean, but it will be necessary to persevere as long as a cultivator can be worked in the cane. Shahjahanpur No. 10, M.187, M.1900 Seedling, N.813, and H.Q.285 are all making satisfactory progress. The first-mentioned is showing a remarkably vigorous growth, and, owing to its hardihood under dry weather and frost, should commend itself increasingly to men on medium soils that are inclined to be cold in winter.

Hambledon Queensland 285 is another cane that is giving satisfaction. It is a quick grower and early maturer, although displaying no outstanding resistance to frost like the Shahjahanpur.

Planters are now trying most of the standard fertilisers, but in their own interests they are advised before using them extensively to obtain information from the Sugar Experiment Station as to what results the particular fertiliser would probably give, stating whether their soil is typical of the Woongarra Scrub loams or otherwise; also, as recommended several times previously, to have analyses of soils made for them by the Bureau. Many hundreds of farmers have had this latter work carried out for them with extremely beneficial results. Fertilising is an important phase of sugar-cane culture, so caution should always be exercised in acting upon assurances given by unqualified persons.

Barolin.

The cane on this area also looks well, but the foregoing remarks on the probable Moongarra tonnage also apply here. Cane varieties making growth and presenting a generally healthy appearance are Q.882, Q.813, M.189 (Black Innis), Shahjahanpur No. 10, Malagache, M.1900 Seedling, C.S.R.3, E.K.1, H.Q.285, M.89, C.S.R.4, Q.1098, Q.813. Of these varieties, it is probable that Q.813 and E.K.1 are looking the best, particularly Q.813. Malagache could also be mentioned as having a very pleasing appearance at present. This variety on the whole is a fairly early maturing cane

and showing considerable immunity to the attack of fungoid parasites and bacterial disease. Cane on the Barolin areas appears to be particularly free from disease this year, although discoloration of the leaf frequently appears. Many people confuse this with "striped leaf disease," but with the exception of very tolerant varieties "striped leaf disease" soon develops marked secondary symptoms which materially affect the growth of the cane and leave little doubt as to the nature of the malady.

Bingera.

Cane growth and the crop prospects equal those of Moongarra and Barolin. The farms, generally speaking, look very well, and the owners are hard at work cultivating and preparing for the autumn planting. Some difficulty may be experienced this year in getting sufficient cane plants, as there appears to be more or less a shortage all round.

Cane varieties at present looking well are Q.813, E.K.1, E.K.2, M.189, H.Q.285, D.1135, and M.1900 Seedling. The growers are recommended to experiment with Shahjahanpur No. 10, especially on the forest soils.

The successful results obtained by the plantation management in the use of molasses on ratoons are worthy of comment. About 200 acres have been treated, and the appearance of the cane leaves no room for doubt as to the benefit of the treatment.

Sharon.

There has been an adequate supply of rain in this locality for the present, and the cane looks correspondingly well. Much of this country is a good forest loam, with patches of scrub soil. On the scrub land, the cane probably looks as well as any in the Bundaberg localities. Good crops are showing on the forest soils, also, the ratoons on both classes of soil appear particularly vigorous. A cane that is showing exceptionally fine growth here is the Q.813. Other canes pleasing the growers are E.K.28, E.K.2, M.1900 Seedling, and D.1135. The farmers are recommended to experiment with H.Q.285.

Grubs appear in small numbers, also white ants make minor attacks; but, taking matters altogether, no appreciable loss is occurring. Bonedust as a general fertiliser should give results on these soils, with light dressings of sulphate of ammonia on ratoons in suitable weathers. Subsoiling should give better results than ordinary work on the forest loam at Sharon; also green manures are strongly recommended. When sterile patches occur in the fields, a simple expedient, if it is available, is to tip a load of animal manure on the patch. These sterile or partially sterile pockets occur frequently and spoil the appearance of a farm.

Bucca.

It is probable that Bucca never looked better. Everywhere the cane presents a healthy, clean, and well-tilthed appearance. Cane pests or diseases are not showing in the cane at present; but here, as elsewhere, the farmers are reminded that this satisfactory condition can only be kept up by careful selection of plants in the case of disease and good cultivation mainly in relation to pests, as this makes the cane grow stronger, and it is consequently more resistant to the ravages of borers and grubs.

In all the districts the roads are far below what they should be. Accessibility to the community centre makes life on the land much more attractive. Good roads are vital to the farmer, and, after all, not a big thing to ask for.

The Director of the Bureau of Sugar Experiment Stations has received the following report (13th February, 1923) from the Northern Field Assistant, Mr. E. H. Osborn:—

Invicta Mill, Haughton Valley.

The rainfall on this area amounted to only 39.86 inches, against an average fall of about 45 inches. The December fall of 6.48 inches came just in time, as the conditions then were extremely dry. At the time of my visit the cane was looking very fair and growing at a great rate. For the season just ended some 37,474 tons were crushed, and of this amount about 10,000 tons came from the Burdekin. Although the average c.c.s. figures were lower than last year, some very high individual results were obtained, for instance, 200 tons of 16 months' old plant, B.208, belonging to Messrs. Brooks and Sons, gave an average density of 18.40 c.c.s. Upon inquiring into arsenic experiments for grub control, it was ascertained that four or five growers are so satisfied with their results that they are still using it at the rate of 40 to 50 lb. to the acre. Local farmers have formed a Beetle Board and are now very busy collecting. Four tractors are already in use; many are on order. Tractors are also being used for pumping water.

Herbert River.

Both the local mills finished crushing in very fair time, and put through about 213,000 tons. Although rather on the light side, the season was a very good one, and no industrial trouble of any kind delayed operations. Prior to the 5.84 inches of rain that fell at the end of December, the cane was rather on the backward side, but at the time of my visit the prospects for the coming season were very good. During last year grubs caused a certain amount of damage in the area and a Beetle Board is also doing very good work collecting same. Rats also did a good deal of damage to last year's crops, but the vigorous campaign carried out by the C.S.R. Company was effective. Cultivation methods are improving vastly and a very large acreage is now under lime and green manures. The Herbert River Farmers' League are interested in a proposition to supply a good quality earth lime to growers at about £2 2s. 6d. per ton on the farms. A lime distributor can also be leased at the rate of 1s. per ton by farmers. The League is also supplying manure in large quantities, and in fact is helping the growers in every possible way. Circulars issued by the Association are printed in English and also in Italian. Steps are also being now taken by the League to connect some of the outside areas by telephone. Among the farms visited in the Ingham area was that of Mr. G. Woods (Victoria Estate). This land consists mainly of shallow clayey soil, and when taken up some thirty years ago was considered one of the poorest and wettest upon Victoria, large portions of it being under water for eight or nine months every year. The present owner, of thirty years' standing, has been yearly adding to the splendid system of tile draining, inaugurated by the C.S.R. Company. The pipes or tiles used are made by the local works and vary from 3 to 12 inches in diameter. They have had to be buried at the necessary level to drain the land and are from 1 foot to 11 feet under the ground. After traversing the various fields they empty into main headland drains varying in depth from a few feet to some 10 or 12. It was impossible to get the total length of tiling, but it certainly runs into miles, and as the price of tiles runs from 4d. per foot up to 1s. 6d. per foot for the 12-inch pipe, it is easy to compute the capital represented by the system. Just prior to my visit, some very heavy rain had fallen, but within forty-eight hours scarifying was in full swing. Without drainage weeks would have elapsed before horses could have got upon the ground. As mentioned previously, a large length of the pipes had to be deeply buried, and to cover these up and also level off some low-lying places, vast quantities of soil had to be carted from the open drains—as many as three drays were continually carting from a distance of ¼ to ½ mile for a period of over three months. With such thorough draining and good cultivation a farm with only a very few inches of poor clayey soil now has a fair quality soil of a depth of, say, 12 or 14 inches, and capable of growing very payable crops of cane. Mr. Wood ploughs with a tractor drawing a 3-disc plough and ratoons with a double mould board ratooning plough. With the latter he gets through over 4 acres per day, ratooning to a depth of 14 inches. "Bedding up" also forms portion of the work upon this farm, and the beds are graded in a beautifully uniform manner, as the crest of the bed is about 2½ feet higher than the bottom of the water furrow, and comes down very gradually; also, it can be noticed that the cane rows adjoining the water furrow are in nearly all cases superior to the other rows in growth. When it is considered that Mr. Wood has practically reclaimed this land and turned it into a property capable of yielding a couple of thousand tons of cane per annum, he is certainly deserving of great credit.

During a visit paid to Trebonne and the Stone River some very fine cane land was seen, the most noticeable being upon the farm of Messrs. Hardy and Burke, consisting mainly of deep alluvial flats. One 16-acre block of first ratoon Badila cut in October last is now over one's head and should cut at the rate of 45 tons to the acre. Nearby was a block of third ratoon with the trash left. This should run into a 20-ton crop, too. Adjoining this farm is Mr. E. D. Row's. This well-worked farm is all plant and first ratoon, giving generally about 36 tons per acre for plant and about 18 to 20 tons for ratoon. Mr. Row is very keen upon green manure, and has at present some 24 acres under peas, which look a picture. The main canes are H.Q.426, N.G.15 (Badila), H.Q.409, Goru, a small quantity of Black Innis, and canes introduced by the company, such as Nanemo, Korpi, and Oramboo, all of which grow well.

Halifax (Macnade.)

Generally speaking the cane looks very well, but hardly as forward as the Victoria supply. So far, for the month of January the rainfall here has not been equal to that at Ingham. Among the farms visited a fine block of Badila plant was noticed upon Mr. J. Evers's property. This should make a heavy crop for 1923. In this area also several new tractors were seen, but the number has not increased as rapidly here as in some of the other sugar-growing areas in the North.

Rollingstone (Townsville-Ingham Railway).

This area supplies cane to the Invicta Mill, and consists of about fourteen farms. Unfortunately, the rainfall here is rather low, only 47.93 inches being registered for last year against 71.72 inches at Ingham. Several of the growers, however, speak of using tractor power for irrigation where water can be obtained from the river. One grower in a rather large way is Mr. S. Macree. His farm is about three-quarters of a mile from Rollingstone upon the opposite side of the creek, and consists of some very fair deep alluvial soil. He will harvest cane from some 15 acres this year, but hopes to have 65 acres under for 1924. Mr. Macree uses a tractor for ploughing and also intends using it for irrigation. A great deal of work has been carried out upon this farm, such as digging central drains to carry off excess water, and filling in several hollows with scoops. A large stock of manure is being used, and some 1,500 bags of stable manure are also to be used. Further up the line a splendid patch of 10 acres of May plant (Badila and B.208) was seen upon Mr. C. Barney's property. The land consists of heavy scrub land of a very good quality, which should grow magnificent crops.

Goondi.

This mill finished a very successful crushing with a total tonnage of 91,000 tons. The coming season should, however, exceed that total, as the cane at present looks very promising. As a whole, the farms are remarkably clean and free from weeds. A very large proportion of the area is also under green manure, of which some really good crops are to be seen. A good deal of liming has also been carried out, but until the Goondi bridge is finished lime will be an expensive item to this area. Among individual crops seen, some remarkably fine first ratoon Badila cane was noticed upon the Upper Daradgee lands, notably the cane of A. S. Mellick, Joddrell, and Cook, and several others in the near vicinity. These should make very heavy crops. Upon the older lands in the Stockton area some really good third ratoons (Badila), a portion of them with the trash left on, was observed upon Mr. G. Hing's farm. This land has been well limed, green manured, and also had a fair quantity of fertilisers; the result is that the ratoons look far more like good first than third ratoons. Very few cane beetles have been noticed lately. Borers were rather bad last year, but it is to be hoped that the release of the fly by the Government Entomologist (Mr. Jarvis) will help to minimise this pest.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS FOR JANUARY, 1923.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Royal Mistress ...	Ayrshire ...	25 Nov., 1922	780	3·8	34·80	
Bellona	,, ...	30 Aug., ,,	780	3·8	34·80	
College Meadow Sweet	Friesian ...	18 Sept., ,,	810	3·5	33·00	
Lady Peggy ...	Ayrshire ...	18 Dec., ,,	810	3·1	32·40	
Pretty Maid of Harelmar	,, ...	11 Sept., ,,	870	3·5	30·60	
College Mignon ...	Jersey ..	20 Nov., ,,	600	4·3	30·00	
Confidence... ...	Ayrshire ...	13 Aug., ,,	690	3·7	29·40	
Hedges Nattie ...	Friesian ...	20 May, ,,	630	4·0	29·40	
Thyra of Myrtle-view	Ayrshire ...	22 Aug., ,,	660	3·7	28·50	
Songstress ...	,, ...	4 July, ,,	600	3·8	26·70	
Dawn of Warragaburra	Jersey ...	17 May, ,,	480	4·7	26·40	
Yarraview Snowdrop	Guernsey ...	1 Sept., ,,	450	5·0	26·40	
College La Cigale	Jersey ...	10 July, ,,	360	5·8	24·60	
Fair Lassie ...	Ayrshire ...	1 Sept., ,,	480	3·9	21·90	
Netherton Belle ...	,, ...	19 July, ,,	420	4·3	21·00	
Miss Fearless ...	,, ...	30 May, ,,	540	3·3	20·70	
Hedges Dutchmaid	Friesian ...	23 Sept., ,,	540	3·2	20·10	
College Bluebell ...	Jersey ...	22 Oct., ,,	360	4·8	20·10	
Miss Betty ...	,, ...	15 May, ,,	360	4·8	20·10	

Rainfall for the Month, 239 points.

STUD STOCK STUDIES.

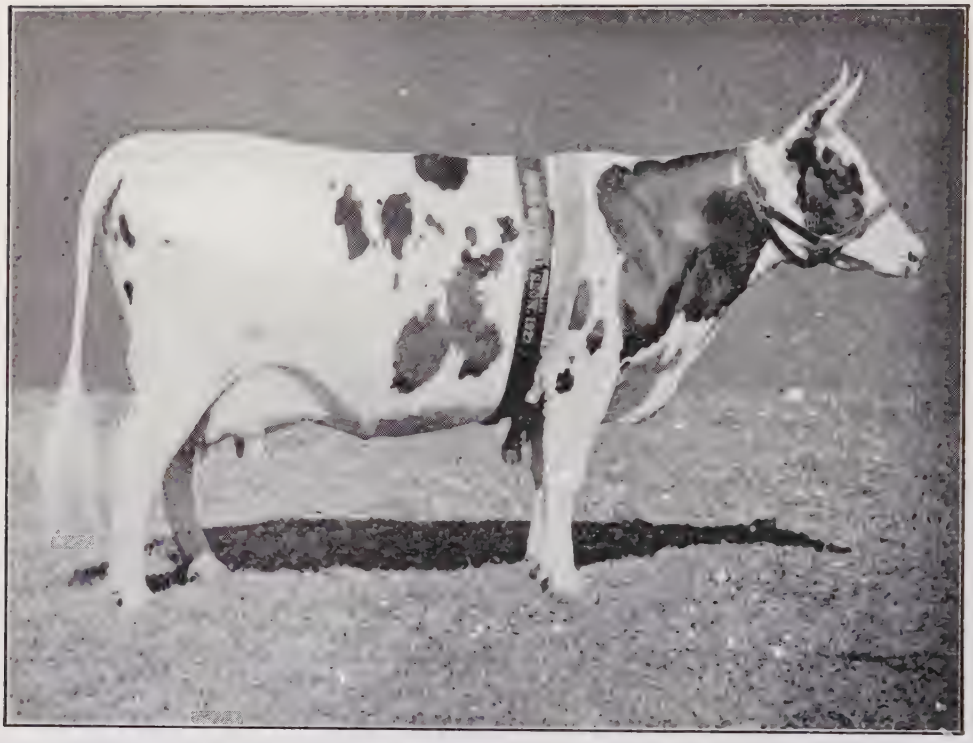

PLATE 46.—BELLE OF LONGLANDS (A.R.Q., 1818).
Champion Ayrshire Cow, Royal National Show, 1922. The property of Mr. Jonas Holmes, Longlands, Pittsworth, Q.

PLATE 47.—A FINE JERSEY TYPE—GINGER FERN OF BROOKLANDS (2470) (A.R.Q.).
The Property of Mr. W. S. Conochie, Tingoora, Q.

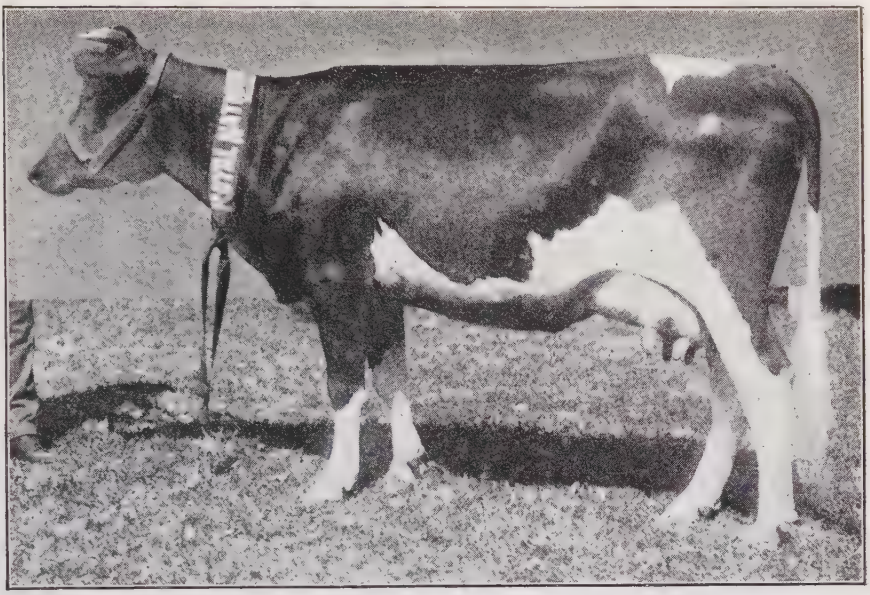

Plate 48.—A Typical Friesian Heifer—Maud Rooker Korndyke (imp., 589). By Tsussie Rajah, dam Minnie Rooker Tsussie. The property of Mr. F. G. Brown.

Plate 49.—A Typical Illawarra Milking Shorthorn Cow—Fuchsia of Strathdhu (431).
By Victor 2nd (27), dam Carnation. Bred by and the property of Mr. S. Mitchell, Warwick, Q.

FERTILISERS, MANURES, AND FERTILISERS ACTS.

By J. C. BRÜNNICH, Agricultural Chemist; and F. F. COLEMAN, Officer in Charge, Seeds, Fertilisers, and Stock Foods Investigation Branch.

The terms "**manure**" and "**fertiliser**" are often used interchangeably by farmers. If a distinction were made, the word "manure" should apply to natural substances, such as farmyard manure or green crops ploughed in for purposes of green manuring, and the term "fertiliser" to such artificial products as sulphate of ammonia, superphosphate, and potash salts, which each supply one chief substance required for the nutrition of plants. For the purpose of this article any substance supplying one or more elements used in the nutrition of plants will be termed "**fertiliser.**"

The value of any fertiliser depends entirely on the relative amounts of the principal constituents—**nitrogen, phosphoric acid, potash** and **lime**—contained therein.

For the protection of the farmers and fruitgrowers, Fertilisers Acts are framed, and as our Department found that "The Fertilisers Act of 1914" did not prevent the sale of inferior products, of very varying composition, as fertilisers, the powers under this Act were extended by "The Fertilisers Act Amendment Act of 1916."

The definition of "**Fertiliser**" under the combined Acts is—Any substance or compound containing, in appreciable quantity, nitrogen, phosphoric acid, potash, or lime, manufactured, produced, or prepared in any manner for fertilising the soil or supplying nutriment to plants; also any excrement of animals or any natural substance, or natural product which is used for fertilising the soil or supplying nutriment to plants. The term does not include farmyard manure, stable manure, seaweed, or crude nightsoil, but any other crude product, or offal, whether specially treated or not, is a fertiliser within the meaning of the Acts if sold for the purposes of fertilising the soil.

From this definition it will be seen that such products as **stable** and **farmyard manure, crude nightsoil, seaweed, tanyard refuse,** and **boiler ashes,** may be sold as manures, without guarantee of composition.

Every person must obtain a license as a dealer under the Acts before offering any fertiliser for sale. Any farmer or other purchaser may ask the vendor to produce his license, and buyers would do well to confine their orders to dealers licensed under the Fertilisers Acts of Queensland.

As under the present amended Act lime and crude fertilisers are included, any person desiring to sell **lime, limestone screenings, coral sand, sheep manure, bat guano,** &c., to farmers for fertilising purposes must apply for a license.

The Acts require every licensed dealer to give the buyer an **invoice certificate** and to affix to every package a plainly-printed **label.** It is of the utmost importance that the buyer, not only obtains, but keeps the invoice certificate covering each kind of fertiliser purchased.

In the case of any dispute the production of the Invoice certificate is esential, it being the seller's guarantee of the article sold, and must bear his signature.

An invoice certificate should be in the form prescribed by the Acts, and is required to set out the name of the licensed dealer, the name of the purchaser, the weight purchased, name of fertiliser, including brands or trade mark if such appear on the bags, also the chemical analysis stating the percentage of nitrogen, phosphoric acid, and potash, and the forms in which they respectively occur. In the case of bonedust, bonemeals, and meatworks fertiliser, other than dried blood, the percentage of fine and coarse material should be declared.

On all invoice certificates and labels the amounts of fertilising ingredients have to be stated in a uniform manner, as the old expressions—like bone phosphate, tricalcic phosphate, ammonia, ammonium sulphate, potassium sulphate, &c.—are liable to mislead the farmer. The Act provides for the statement of the valuable fertilising ingredients in percentage amounts of **Nitrogen** (N). **Potash** (K_2O), **Phosphoric Acid** (P_2O_5), **Lime** (CaO).

In the case of **agricultural lime** the percentage of coarse material and fine material must be stated, together with the percentage of lime as **lime carbonate** ($CaCO_3$), and in the case of gypsum the percentage of **lime sulphate** ($CaSO_4$). With burnt lime or quick lime the percentage of **calcium oxide** (CaO) must be declared.

For purposes of explanation we will suppose that W. Buyer, of Cheriton, purchases some meatworks fertiliser from A. Seller, of Summertown, a licensed dealer under the Acts. The vendor, A. Seller, must, on the sale of the fertiliser, whether paid for at the time or not, give to the buyer, at the time of sale or before delivery, an **invoice certificate** signed by the vendor setting out the required particulars. We will assume that the fertiliser in question has been found on analysis to contain 5·5 per cent. of nitrogen in the form of blood, flesh, and bone, 16·2 per cent. total phosphoric acid, and 70 per cent. of the sample is fine, 26 per cent. coarse, 4 per cent. unspecified. The vendor should give the buyer an invoice certificate in the following form:—

"THE FERTILISERS ACTS, 1914 TO 1916."

Invoice Certificate.

I, **A. Seller, Summertown,** in the State of Queensland, licensed dealer under "*The Fertilisers Acts,* 1914 *to* 1916," hereby certify that the fertiliser this day sold by me to **W. Buyer, Cheriton,** being a quantity of **3 tons 4 cwt. 2 qr. 8 lb.,** is known as **Meatworks Fertiliser,** and is marked with the figure, or trade mark, or sign following, that is to say, **M.F.B.S.**

And I also certify that such fertiliser contains the following ingredients, in the proportion of the whole, set opposite thereto, in the form hereunder:—

Nitrogen, — per centum, as sodium nitrate.
Nitrogen, — per centum, as ammonium sulphate.
Nitrogen, } per centum, as blood.
Nitrogen, **5.5** } per centum, as flesh and offal.
Nitrogen, } per centum, as bone nitrogen.
Nitrogen, — per centum, unspecified.
Phosphoric Acid, — per centum, as water soluble phosphoric acid.
Phosphoric Acid, — per centum, as citrate soluble phosphoric acid.

Phosphoric Acid, — per centum, as citrate insoluble phosphoric acid.
Phosphoric Acid, **16.2** per centum, total phosphoric acid.
Potash, — per centum, as potassium sulphate.
Potash, — per centum, as potassium chloride.
Potash, — per centum, insoluble and unspecified.

Fine material, **70** per centum.
Coarse material, **26** per centum.
Unspecified, **4** per centum.

In the case of excrement of animals or any natural substance or natural product which is used for fertilising the soil, or supplying nutriments to plants, other than stable manure, seaweed, or crude nightsoil, the average analysis is as under:—

Nitrogen, per centum. Phosphoric acid, per centum. Potash, per centum.

In the case of lime for fertilising purposes:—

(*a*) Caustic lime, or burnt lime, or quick lime—
Calcium oxide (CaO), per centum.

(*b*) Mild lime, or air-slaked lime—
Hydrate of lime ($Ca(OH)_2$), per centum.
Lime carbonate ($CaCO_3$), per centum.
} Fine material, per centum.

(*c*) Agricultural lime—
Lime carbonate ($CaCO_3$), per centum.
} Coarse material, per centum.

(*d*) Gypsum—
Lime sulphate ($CaSO_4$), per centum.

In the case of ashes, or wood ashes:—
Potash, per centum. Phosphoric acid, per centum. Lime (CaO), per centum.

Dated at **Summertown,** this **twentieth day of February,** 1923.

(Signature of dealer) **A. SELLER.**

Each bag of fertiliser sold must have attached thereto a plainly-printed **label** clearly and truly certifying—

(*a*) The number of net pounds of fertiliser in the bag;

(*b*) The figure, trade mark, or other sign under which the fertiliser is sold;

(*c*) The chemical analysis, stating the percentage of nitrogen, phosphoric acid, and potash, and the *forms* in which they respectively occur, and the percentage of fine and coarse material, &c., as required by the invoice certificate.

It will therefore be noted that the only material difference between the invoice certificate and the printed label is that in the former the total weight of the fertiliser is stated, and in the latter the *net* number of pounds in the bag to which the label is attached.

Our buyer should find on each bag of meatworks fertiliser that he purchases from the vendor, Mr. Seller, a label in the following form:—

M.F.B.S.

MEATWORKS FERTILISER.

160 lb. net.

Nitrogen	5.5 per cent.	as blood, flesh, and bone.
Phosphoric acid	16.2 per cent.	total phosphoric acid.
Fine material	70 per cent.	
Coarse material	26 per cent.	
Unspecified	4 per cent.	

A. SELLER, Summertown.

As the printed label is an important matter to the buyer, specimens of labels for agricultural lime and a mixed fertiliser are given.

AGRICULTURAL LIME.
180 lb. net.

Lime carbonate	95 per cent.
Fine material	50 per cent.
Coarse material	50 per cent.

A. SELLER, Summertown.

CANE FERTILISER.
180 lb. net.

Nitrogen	7.2 per cent. as ammonium sulphate.
Phosphoric acid	7.0 per cent. as water soluble phosphoric acid.
Potash	7.4 per cent. as potassium sulphate.

A. SELLER, Summertown.

The **monetary manurial value** per ton has been fixed for some time under "The Profiteering Prevention Act of 1920." The **unit values,** which are the cost price of 1 per centum of the various fertilising constituents per ton, or the actual cost value of every 22·4 lb. of such constituent.

The present unit values were fixed by Prices Notifications Nos. 386 and 396, which appeared in the "Government Gazettes" of 7th October, 1922, and 4th November, 1922, and are as follows:—

The maximum price f.o.b. or f.o.r. to any buyer of any fertiliser as specified herein of half-ton lots and over shall be based on registered analysis or certified actual analysis, as under:—

	Unit Value. s.	d.
Per Unit of Nitrogen (N)—		
As Nitrate of Soda	30	0
As Ammonium Sulphate	20	0
As dried blood, or blood manure only	24	0
As bone, flesh, blood and offal, fine	24	0
As bone, flesh, blood and offal, coarse	20	0
As bone, flesh, blood and offal, unspecified	17	0
As bone, flesh, blood and offal, unspecified lumps	14	0
Per Unit of Phosphoric Acid (P_2O_5)—		
As Water Soluble in Superphosphate	8	6
As Citrate Soluble in Basic Superphosphate	8	6
As Citrate Soluble in Finely Ground Thomas Phosphate or Basic Slag	8	6
As Citrate Soluble in Finely Ground Mineral or Rock Phosphate	5	6
As Citrate Insoluble in Ground Mineral or Rock Phosphate	4	0
Unspecified	3	0
As Citrate Soluble in Finely Ground Island Phosphate and Guano	5	6
As bone, fine	5	6
As bone, Island Phosphate and Guano, coarse	4	0
As bone, Island Phosphate and Guano, unspecified and unspecified lumps	3	0

Per Unit of Potash (K_2O)—	
As Muriate	8 0
As Sulphate	9 6
Unspecified, Water Soluble	7 6
Unspecified, soluble in Hydrochloric Acid	4 3
Per Unit of Lime (CaO)—	
As Ground Carbonate (in mixtures only)	1 0
As Sulphate (in mixtures only)	1 3

DEFINITIONS.

"Fine" to signify in the case of—

(*a*) Thomas phosphate or basic slag, particles smaller than one-hundredth of an inch.

(*b*) Rock phosphates and guano phosphates, particles smaller than one-fiftieth of an inch.

(*c*) Bone, flesh, and offal, particles smaller than one-fiftieth of an inch.

"Coarse" to signify particles larger than one-fiftieth of an inch and smaller than one-tenth of an inch.

"Unspecified" to signify particles larger than one-tenth of an inch and smaller than one-half of an inch.

"Unspecified lumps" to signify particles larger than one-half inch.

The "unit value" for all fertilisers applies in an area within a radius of 10 miles from the G.P.O., Brisbane, and for all meatworks products, and guano and island phosphates, or any other natural product, to the areas in which the factory is located or the product is obtained.

For all fertilisers scheduled, the state of fineness must be declared by stating the percentage amounts of "fine," "coarse," and "unspecified" particles in the product.

For fertilisers like superphosphates, nitrate of soda, ammonium sulphate, and mixed fertilisers containing any of these fertilisers liable to destroy the bags in short periods, a rebagging charge of 13s. per ton may be allowed, if such rebagging has actually become necessary.

Mixed artificial fertilisers containing superphosphates, and ammonium sulphate or muriate of potash, or both, or for any manure other than basic superphosphate, specially mixed for trade purposes, an extra charge of £1 per ton for mixing may be made, and for basic superphosphate a special mixing charge of thirty shillings (30s.) per ton may be made.

Dealers purchasing from meatworks or bacon factories or Island Phosphate and Guano companies or any other producers, and selling from stock, may charge in half-ton lots or over: 10 per cent. on maximum prices fixed.

Dealers and producers, selling from stock, may charge in lots of 1 cwt. and over, but less than half-ton, 1s. per cwt. extra on maximum prices fixed.

For fertiliser works at and north of Mackay, on account of increased cost of labour and handling, an extra additional charge of five (5) per cent. will be allowed to be made on the calculated total cost.

CALCULATION OF COST OF FERTILISER FROM UNIT VALUES.

From the maximum prices before referred to it will be noted that the unit value of nitrogen as ammonium sulphate is 20s. per unit, water soluble phosphoric acid 8s. 6d. per unit, sulphate of potash 9s. 6d. per unit, and that £1 per ton is allowed for mixing charges. It therefore follows that the price of a **cane fertiliser,** with an analysis of 7·2 per cent. nitrogen as ammonium sulphate, 7 per cent. phosphoric acid (water soluble, and 7·4 per cent. of sulphate of potash, according to previously shown label, would cost, at Brisbane, £14 13s. 10d. per ton.

	£	*s.*	*d.*
7·2 per cent. nitrogen, as Ammonium Sulphate, at 20s.	7	4	0
7 per cent. of Phosphoric Acid, water soluble, at 8s. 6d.	2	19	6
7·4 per cent. Sulphate of Potash, at 9s. 6d.	3	10	4
Mixing charge	1	0	0
Cost per ton at Brisbane	£14	13	10

Buyers would do well to keep in mind that the Fertilisers Acts do not prescribe **standards** for fertilisers. The value of any particular brand or kind can only be calculated on the fertilising constituents guaranteed by the vendor to be present. In particular it is to be noted that, although meatworks and fertilisers of a like nature vary from time to time, they are still sold under the same brand or trade mark, and their actual value per ton may be up or down in accordance with the amount of nitrogen and phosphoric acid that they contain, as declared on the label.

It therefore follows that a buyer should first find what the seller guarantees; a low price per ton does not always mean a cheap fertiliser. The value depends entirely on the percentage of nitrogen, phosphoric acid, and potash that the goods contain. With the help of the list of present unit values, the buyer can get a good idea as to the relative merits of different brands, always taking into consideration the important factor of freight.

When the Buyer is in Doubt.

Any farmer in doubt as to the quality or any other matter concerning any fertiliser that he has purchased, should at once write to the Department of Agriculture, Brisbane.

Samples under certain conditions laid down by the Regulations under the Acts may be sent to the Department for analysis, the charge for which to a buyer, other than a dealer, is only nominal. In most cases, however, the quickest and best method of deciding any point in connection with a purchase is to write to the Department giving the following particulars:—

Name of fertiliser:	Invoice certificate and label:
Name and address of seller:	Date of delivery:
Quantity purchased:	Name and address of buyer:

All correspondence should be addressed to—

The UNDER SECRETARY,
Department of Agriculture and Stock, Brisbane.

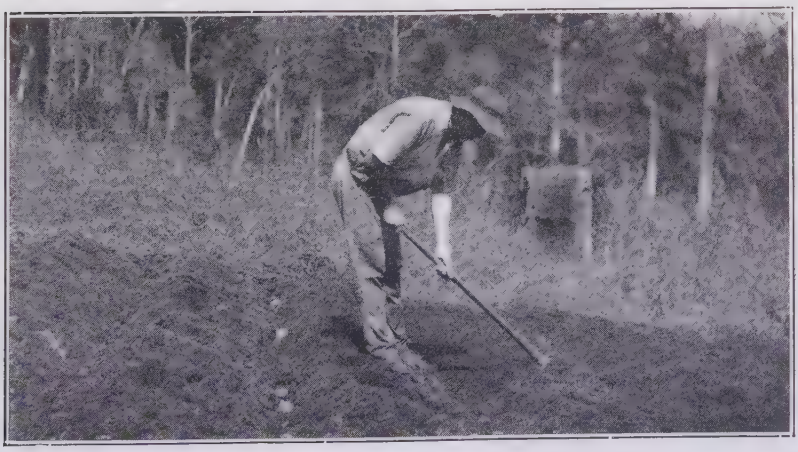

Photo: A. Blakey, Junr.]

PLATE 50.—THE POTATO PLANTER.

THE COTTON WORM* *CHLORIDEA (HELIOTHIS) OBSOLETA*, SAY.

By HENRY TRYON, Entomologist.

INTRODUCTORY.

This cotton pest that the present writer described thirty-four years since as a Queensland destructive insect (vid. Tryon, H. "Insect and Fungus Pests," pp. 190-192, Brisbane, 1889) under the name *Heliothis armiger*,† and as injuriously related to the maize plant, and that was evidently one of the insects much earlier recognised but not definitely identified as an enemy to cotton in Southern Queensland, has this present season manifested its injuriousness in relation to the latter plant over a wide area.

Our earliest intimation of its perniciousness was afforded by the receipt of specimens of the caterpillars from the Toogoolawah district, forwarded therefrom on 28th December. This was soon followed by evidence of its presence in the cotton crop in the Rosewood-Dugandan area. These facts formed the occasion for a special Press report on the subject that was first printed in the "Queensland Times," Ipswich, 17th January, 1923 ("The Cotton Boll Worm—Discoveries in West Moreton"), and that, it is understood, has since been reproduced in other newspapers.

Subsequent to these latter occurrences, the same insect has been brought under our notice as seriously damaging the cotton plant as far west as Chinchilla, in Southern Queensland, in the Cooran, Kilcoy, Woolooga, and Biggenden areas, nearer the coast, and again in the important Central area (Rockhampton). It is unlikely, however, that these indications of local occurrences mark the limit of its range.

Referring to the United States of America, it has been officially stated—"Until the advent of the Mexican Cotton Boll Weevil the Boll Worm was easily the most serious of the numerous insect pests of the cotton plant"—and since already in Queensland its capabilities for occasioning serious loss of crop have been manifested, it is a pest whose presence must be regarded as being of serious significance here also.

The very great attention also that has been bestowed upon this injurious insect will appear from the fact that a bibliography relating to it "largely prepared by Mr. A. A. Girault," and including reference to the commencement of 1905 only, embraced no less than 252 titles, and many additional ones would be required to bring it up to date. This is given in "The Cotton Boll Worm," by A. L. Quaintance and C. T. Brues, Bulletin 50, Bureau of Entomology, U.S. Department of Agriculture, 1905, an elaborate technical Bulletin of 155 pages that we have largely availed ourself of in what follows.

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*This insect is quite distinct, both from the point of view of its habits and the nature and extent of its depredations, from the notorious Boll Weevil (*Anthonomus grandis*)—a beetle, and also from the Pink Boll Worm (*Pectinophora gossypiella*), a diminutive moth, both so destructive to cotton in other countries. It is an insect, on the other hand, long familiar to the Queensland farmer as harmful to maize and to the tomato.

†In this article the specific name *obsoleta*, Say, has been used for the insect, following American authority. The reasons for substituting this for *armigera*, Hübner, do not, however, appear to me very conclusive. Our cotton pest is the *Chloridea armigera*, Hübner, of Hampson. *Vide* Catalogue of the Lepidoptera Phalænæ, IV. Noctuidæ 56, p. 45, London, 1903).

DAMAGE TO COTTON.

The insect is injuriously associated with a large number of plants, some figuring in staple agricultural crops—and in Queensland, especially with Cotton, Maize, Tomatoes, Tobacco, and Peas; but its injuries to the first of these will alone now claim our attention. The fact, however, of this very general dietary is of great significance both in explaining its occurrence as a plant pest and in controlling the same. In fact, it has been stated with regard to the United States occurrence that "the injury to the cotton crop is largely by the third and fourth generations of larvæ" alone. Those of previous generations attack other plants, and in Queensland it is not the first generation caterpillars that are ordinarily associated with the damage.

(a) Injury to Foliage—

This is occasionally manifested when the plants are young and have as yet not commenced to flower; but even after defoliation the plants attacked may completely recover, especially should good growing conditions prevail.

(b) Injury to the Flower Buds or "Squares"—

This is the most serious form of injury, since the "square" attacked almost invariably falls off, even when the injury is very slight indeed. This injury takes the form of a small hole that the caterpillar gnaws into the bud, most commonly through the portion representing the unexpanded corolla; very seldom an additional one is also present. At times, when the flower bud is small, the leaves at the base of the bud (the involucre) are first passed through in gaining access to its interior. These holes may vary in size according to the age of the caterpillar, each boring during its life and growth into and feeding into, on an average, 8 to 9 squares, although a single larvæ has been known to damage as many as eighteen. Meanwhile, the worm commences exercising this peculiar habit two days after it has issued from the egg, and when only about $\frac{1}{8}$ inch in length. It continues doing this throughout its life, whether or not the plant has developed flower buds.

(c) Expanded Flower—

This again may claim the insect's attentions often to an extent that causes it to fall to pieces.

(d) The Boll—

The bolls again may be attacked. Usually, as buds, flowers, and bolls are present at the same time on a single plant, or succeed one another on any part of it, the caterpillar may bore into these, either after having served to throw down "squares" that it has attacked, or do so exclusively. When a caterpillar has entered a cotton boll, it may thenceforth confine its attention to it until it is full-fed; and not injure one boll and crawl to another to damage it in turn, as happens in the case of the "squares." Thus, when primarily attacking these the damage may be far less extensive than when the buds are principally claiming its attention. It may be added also that the injury to the cotton boll does not alone consist in the material consumed, for it also renders the admission of mould-fungi and other fungi possible, and so conduces to discoloration and decay of the lint. This secondary damage is more liable to be realised when wet weather prevails. These several injuries may bring about an almost complete loss of crop, as has already been experienced through the attacks of the boll worm in Queensland.

DESCRIPTION OF INSECT.

The caterpillar, it need scarcely be remarked, represents but one stage of four in the life-history of a moth, each of which is characterised by quite distinct outward features and habits of life. These are (*a*) egg, (*b*) larva or caterpillar, (*c*) chrysalis, and (*d*) adult insect—the moth of both sexes.

The Moth—

This is a stout-bodied insect, measuring about 18 millimetres, $\frac{2}{3}$ inch from head to tail. When settled, the front wings, that almost conceal the hind ones, form a rather wide angle with the body and slightly slope downwards at the sides. These organs when extended together attain 40·4 millimetres, the females usually being somewhat larger. These organs are usually of a general drab-colour sometimes tinted with a reddish suffusion. They have usually an indistinct brown band with a festooned inner margin within their outer (posterior) borders, and a dark discal mark, traversed by a dark line. The hind wings are whitish coloured with the veins and broad apical band almost black. The outer wing margin is also brown, the latter often with a reddish suffusion. The mid-body (thorax) is broad and densely and smoothly clothed with pale greyish-brown hair-like scales. The two sexes are very much alike, but the male has a narrower hind-body.

The Eggs—

These are white objects, apparently almost spherical, but really low dome-shaped with flattened bases. Under the lense they exhibit numerous little ribs radiating from a central spot and united by fine bar-like lines. They are rather less than 1·50 inch in breadth.

The Caterpillar—

This varies at its different stages of growth, is elongated, almost hairless, and three pairs of claw-like bearing true legs, and six pairs of abdominal and one pair of caudal (tail) foot pads (prolegs). In the condition generally observed it is pale brown above, this hue of colour being really produced by a few little longitudinal dark lines, and very pale greyish white beneath; the base and upper surface being separated by a broad yellowish-white band extending the length of the body in which the breathing pores (spiracles) are included. There is also a distinct band, usually double, along the centre of the back. A series of yellow or orange spots also occur along the sides. There are also a series of hair-bearing black points with definite arrangement. The insect usually attains ultimately a length of 42·25 millimetres (21 lines).

A. A. Girault has described six instars or distinct stages of growth, separated each by a casting of the skin (ecdyses). In the first of these succeeding the egg, the caterpillar, at first 1·5 millimetres in length, attains a length of 3·8 millimetres. In the first two of these instars the insect does not exhibit the longitudinal bands later on so conspicuous.

Chrysalis—

The chrysalis is dark-brown and smooth, and presents features in which the body-segments and the folded wings and legs (now both encased) are recognisable. The tail end of the body is elongated and terminates in two spines, one of which is larger than the other—the two almost touching. It measures about $1\frac{1}{4}$ inch in length.

HABITS OF INSECT.

Moth—

The moth flies by night—seldom by day except when disturbed. Then it moves off with suddenness and rapidity to soon alight again and run off to concealment, its colour and colour pattern assisting it then in eluding discovery when settled. Thus disturbed when upon a maize plant, it will usually seek harbourage in another growing close at hand.

It feeds upon the nectar of flowers, including those of the cotton plant itself; again, in that issuing from special glands on the leaf stalks and other part of plants not yet in flower, and also, further, on the sweet fluid excretory matters that emanate from aphides and related insects.

The female and male moths occur in about equal proportion. The full term of the lives of both male and female under natural conditions is to some extent uncertain, but when in confinement, individuals can be kept alive, exercising care, for from seventeen to thirty-eight days, as shown by Girault in the course of his experiments.

Eggs—

Each female moth may lay from 500 to 3,000 eggs, the number being apparently determined by the food secured by it. Observations elsewhere, however, have shown (fortunately) that many of these eggs do not hatch, even when not destroyed by the indwelling presence of some egg-parasite.

When about to lay, an operation that takes place usually soon after sun-down when darkness is coming on, the moth may be observed quickly vibrating its wings in nervous flight as it hovers over some cotton flower-bud, or other portion of the plant, but the while affixing its eggs one by one on the several parts of it, but especially on the former.

Girault noted at different times during a period of eleven months the habits of twenty-four female moths in depositing their eggs. He found that eleven different places were selected for this purpose, nine of which were upon the cotton plant; that, in fact, harboured all but 5 per cent. of those deposited. Also, that of the eight positions on the plant on which the eggs might occur, 28·5 per cent. of the total eggs laid were upon the flower-buds or squares; the foliage (both leaf-surfaces) and bolls being the parts that came next from the point of view of eggs received. Only a few eggs are thus laid indiscriminately here and there on an individual plant.

These facts have an important bearing, since it is only the quite young caterpillars that occur, of course, near the eggs from which they have hatched out that are accessible to practical methods of destruction.

With regard to the length of the egg-stage, the lastmentioned investigator has again shown that this may be of as brief duration as two and a-quarter days, but that, taking an entire season (in U.S.A.), may extend even to seventeen days, but is, generally speaking, nearer the lower limit—*i.e.*, from two and a-half to four days. Further, that this variation is principally governed by that of the temperature to which they are subjected.

Larva or Caterpillar—

On hatching from the egg the boll-worm caterpillar is very small, being only 1·5 mm (1-16 in.) in length, and it is only 3·8 millimetres

when it casts its first skin (first ecdysis) and is three and a-half days (about) old. It again grows during life until it is nearly 1 4-5 inch in length and is twenty-one days old.

This development is, however, reached in six different stages (instars), each separated—as is the first—by a molting of the skin and a brief interval of rest. These instars are distinguished, not only by difference in size, but also to a slight extent in general colour and pattern of markings. Thus the caterpillar at first is uniformly pale, translucent, yellowish in certain lights—greenish after feeding, with the head and a plate behind it—the back cervical shield—nearly black.

The minute caterpillar on hatching and after consuming the abandoned egg-shell soon acquires activity and wanders in search of a suitable feeding-place and food. We have found them repeatedly within the growing tips of the plants, amongst immature leaves and flower-buds, for they need tender plant-tissue for their sustenance. As we have seen, it especially seeks out the flower-buds or squares, and having found one very quickly enters within the "leaves" or parts of the involucre that covers and protects this as it develops. Then at once it gnaws a little hole usually into the upper part of the flower-bud that corresponds to the corolla, and starts feeding on the inner parts, stamens, &c., eating these out, and henceforth does the damage we have described to both squares and bolls or to one of these only.

The Chrysalis or Pupa—

When the caterpillar is "full fed" and has arrived at its limit of growth it finds its way to the ground, and soon crawls away from the main stem to a distance not exceeding two or three feet, when it commences to work its way beneath the surface, digging slantingly downwards to a depth of from one to seven inches. Then it works upwards again forming a curved tunnel, with smooth walls of well packed earth webbed together by a thin coating of silk. This brings this ascending branch of the tunnel to one-eighth or one-fourth of an inch below the surface, leaving a thin wall of earth through which the moth must penetrate on emerging. In the lower end of the tunnel, when all this work has been completed, the caterpillar transforms to a chrysalis or pupa.

This stage in the insect's life varies according to the temperature to which the pupa is subject. It may be as short as ten and a-half days, and again may be protracted when the weather is cold to twenty days with an average, say, of fourteen days; but it has been found that the moth does not generally issue at once from the ground, remaining in its cell for sometimes a day or two longer.

Other Food Plants—

Amongst the habits of the Cotton Boll Worm allusion must be made generally to the very large number of plants on which it will subsist and thrive. Messrs. Quaintance and C. T. Brues have enumerated no less than seventy of these, comprised in as many as twenty-two plant families. The principal ones, as we have seen in Queensland,

are, however, Maize, Cotton, Tomato, Tobacco, Cape Gooseberry, Peas, and several garden flowery plants—*e.g.*, Snap Dragon (Antirrhinum). In connection with its occurrence on the cotton plant, it is especially necessary to take cognizance of the exact relationship that obtains between it and the maize plant—a matter that cannot be entered upon here, but is alluded to—in a different connection—later on.

The Successive Generations—

The dates of captures of the Cotton Boll Worm Moth at large during the annual season of its activity extending for several months, and consideration of the length of a single life cycle, concur in indicating that there are several successive broods or generations of the insect each year. As far as Queensland is concerned we have no data—derived from observation—whence we can conclude what is the number of these generations. A. A. Girault and F. C. Bishopp, the entomologists who carried out the laboratory investigations in connection with the Cotton Boll Worm in Texas in 1904-5, for the United States Bureau of Entomology, have, however, given us an indirect means of estimating this number. They discovered, in fact, that there was a definite relation between atmospheric temperature and this number in the districts covered by their inquiry. Thus they were lead to assume that in each locality "the average effective temperature required for a single life-cycle within the season of the insects' activity was 1,417 deg. Fahr., that the activity in spring did not begin until the monthly mean temperature was 10 to 15 deg. Fahr., ceasing in the autumn at the same temperature." Thus it was calculated that in Florida, where the seasonal activity extended throughout the year and the total effective temperature was 11,058 deg. Fahr., the generations numbered $\frac{11}{1}\frac{5}{4}\frac{0}{17}$ deg. = 7·9; that in Texas (Paris) the corresponding figures were $\frac{6}{1}\frac{8}{4}\frac{0}{17}\frac{2}{7}$ deg. = 4·2, and that in New York, it fell to $\frac{2}{1}\frac{2}{4}\frac{1}{17}\frac{7}{7}$ deg. = 1·5. Moreover, it was discovered that the calculated number of generations (*i.e.*, 7·9, 4·2, and 1·5 and others cited) corresponded to the number of generations reported from direct observation—*e.g.*, Texas 4, Ontario, Canada, 1-2. This fact of the occurrence of successive generations during the season corresponding in time approximately to a certain succession adopted in practice in the growth of crop-plants, and the recognition of a definite life-cycle has had an important bearing in devising, as we shall see, a cultural method for Boll Worm control.

CONTROL MEASURES.

A. Non-Successful Control Measures—

(1) *Poisoning with Arsenical Salts.*—The great success in destroying another cotton caterpillar the "Army Worm" (*Alletia argillacea*), one that does not occur in Australia, by the use of Paris green, has *suggested* the feasibility of producing similar good results in the case of the Cotton Boll Worm by the application of this chemical or of arsenate of lime, or of arsenate of lead.

But with the Boll Worm (*Chloridea obsoleta*), similarly successful results are, however, not obtainable in practice, since this insect is

for the most part an internal feeder, and so is alone accessible to the poison during the two or three days after it has hatched from the egg, when it is a very small object; a fact that involves for success a very timely application of the poison, or its presence on the plant (that it is difficult to preserve) when this hatching-out takes place. And it may be remarked that when used, it is customary to apply the poison in the dust form—*i.e.*, diluted—instead of with water, with nine or ten times its *bulk* of some powder—*e.g.*, air-slaked lime, or dry but damaged flour.

As regards this question, it may be mentioned that in November, 1921, at a conference of the entomologists of the cotton States of America, at which thirty attended, this general question of the efficacy of thus poisoning the Cotton Boll Worm was fully discussed, and that the conclusion that was arrived at was generally unfavourable to its use. In fact, the Texas entomologist, R. E. MacDonald, stated that in the course of experiments greater damage (through the destruction of predatory insects) took place where arsenical dusting was adopted than where it was not, a statement that was verified by F. C. Bishopp, the entomologist of the United States Department of Agriculture, whilst another entomologist stated that it had taken eight or nine applications to put down an infestation, and that this did not pay.

(2.) *Use of Trap Lights.*—It has been conclusively shown that trap lights that may prove most useful in assisting in the control of another cotton pest of Queensland, the Cut Worm (*Agrotis*), and that also constitute the principal measure used against Cotton Cut Worms in British India, are of little or no avail in controlling the Cotton Boll Worm (*Chloridea* (*Heliothis*) *obsoleta*). When they are attracted by light, they settle on surrounding objects and are not, as are many insects, lured to their destruction. Hence, light may prove even a means of increasing their numbers—at least, locally.

B. Successful Control Measures—

(1) TRAPPING BY USE OF A TRAP CROP.—In the cotton belt of the United States it is recognised that the Boll Worm Moth, on its first appearance in the spring, does not attack the cotton-plant; and from the dates on which its injuries were reported in our cotton-growing areas the same observation applies to these also. In the former region it is not since cotton-fields are not available, but by reason of the fact that it prefers another food-plant. This favoured plant is the maize, that is usually found growing throughout the States known as cotton States. In fact, it is recognised that the insect that is termed by the maizegrower the "Corn Ear Worm" on the corn-plant drying out in the ordinary course of events, the moths that the Corn Ear Worms have yielded pass to the cotton to lay their eggs thereupon and so infest them. It is thus the third or fourth generations of insects that commence attacks on the cotton, and then only when the growing maize is failing them. And, moreover, the period in the growth of the cotton plant when this event takes place is that in which the flower-buds or "squares" especially favoured by the moth are coming into prominence.

This fact being recognised, a means of controlling the Cotton Boll Worm has been devised, consisting in raising a special growth of the maize so that it will form a trap crop. For this purpose a particular variety of maize is selected that has a rapidly maturing habit as one of its characteristics, and its sowing is so timed that (1) its specially attractive stage (*i.e.*, when it has just finished "silking," or even is a little less advanced and the "silk" is already showing), is attained at the

same time (2) that the cotton is manifesting its flower buds or "squares" and has attained its Boll Worm attractive stage also; and when these events correspond in time to that of (3) the appearance, say, of the third or fourth generation of moths (at the end of a life-cycle of thirty to thirty-five days, as commonly happens), the presence of the more favoured crop—the maize—saves the cotton from being visited by the moths, and so from being Boll Worm infested.

In the practice of this method, every 200 rows of cotton are alternated with five or six rows of maize, or small plots of maize are distributed through the cotton block.

It is further necessary that before the caterpillars, that have developed from the moth's eggs that have been laid on the silk where they are most commonly placed, have reached a stage of growth short of that when they would naturally leave the plant and enter the soil, this maize must be removed, and may be used as ensilage or stover, otherwise it will merely yield a brood of moths to attack the cotton when in boll.

It will appear from this that the successful employment of the trap crop method depends on a precise knowledge of the growth of the two plants, of the relations that subsist between these and the insects, and of the existence of some order in the progress of the season of growth—conditions difficult at present of being met in Queensland.

(2) Cotton Cultural Procedures.—1. From what we have stated regarding the habits, it is to be concluded that the moth is less addicted to laying its eggs on individual cotton bolls than on individual cotton squares, and also that if it does lay its egg upon the former much less damage will result than if it deposit in a square in the first instance, since a single caterpillar will restrict its attention to one or two bolls that provide sufficient sustenance to enable it to fully develop; whilst the same insect would pass from one "square" to another, and destroy almost a score of them or not much less.

It, therefore, follows that a measure of control of Boll Worm injury is reached by selecting a quickly maturing cotton, and by cultivating it well and following other agricultural procedures that conduce to its generous and rapid growth, so as to get it beyond its especial vulnerable stage before the moths bent on attacking it appear, and that as we have seen are furnished by other crops earlier sown, and on which the insect also breeds—maize especially, but also tomatoes, Cape gooseberries, &c.

2. Clean cultivation will materially lessen the insects available for subsequently grown cotton, both by bringing about the exposure of them (chrysalises, &c.) to the fatal influence of the sun's heat, in using the implements of tillage, and by rendering them more accessible to the attacks of soil-frequenting predatory beetles, ants, and birds.

3. The avoidance of growing cotton as a ratoon crop, and of the conditions in the field it brings about, especially conduces to a lessening in the numbers of Cotton Boll Worms.

4. For the same reason, the custom of leaving maize standing in the field long after the cobs are ripe conduces to the same harmful result as well as to the presence of other cotton-injurious insects.

(3) Parasites.—The fact of the insect having a succession of broods during the summer months, of its having—as a caterpillar—so many different food plants, especially amongst those in cultivation and

certain of which—*e.g.*, maize, cotton, tomato, &c.—are more favoured than others, and of its being almost wholly an internal feeder, renders it, as we have seen, almost impracticable to deal with this Boll Worm by the ordinary procedures used in contending with destructive insects generally and that involve the use of insecticides. So, again, the habits of the moth itself render the use of both poison-baits and trap-lights of but little avail, if any. The question under these circumstances—What about the use of parasites?—presents itself.

Now, there are several of these natural enemies of the Boll Worm, including both parasites of the egg and parasites of the larvæ (caterpillars). Thus in the United States of America several in both groups have been met with and described.

(*a*) *Egg Parasites.*—One of these (*Trichogramma pretiosa,* Riley) has been described as being "extremely abundant and of great value." This is a small Chalcidid fly, scarcely visible to the naked eye, measuring but 3-10 to 4-10 of a millimetre in length. A. A. Girault, who paid continuous attention to it and its habits during several months, states regarding it that its life-cycle is from eight to eleven days only, the shorter period corresponding to the summer months, also that there may be fifteen continuous generations during this period. Further, that during two years, 1903-4, the proportion of Boll Worm Moth eggs, from different sources, and yielded by three distinct kinds of plants that were parasitised, was practically the same—*i.e.*, rather more than 63 per cent. Further, that more than one Trichogramma fly might lay its egg in that of the Cotton Boll Worm Moth. A second egg-parasite, a Proctotrypid fly, has also been met with in the United State of America, but is evidently very rare there.

(*b*) *Larva-parasites or Caterpillar-parasites.*—These known are of two classes—hymenopterous and dipterous. Of the former (Hymenoptera) is a small, black, red-legged fly, measuring 4 millimetres (2 lines) to 4·5 millimetres ($2\frac{1}{4}$ lines) in length, a Braconid fly named *Micropolites nigripennis,* Ashm. The female of this lays a single egg in a partially grown caterpillar, and the resulting grub feeds within and upon it, working its way when full-grown outwards from a point near the head of the caterpillar, when this is only partly grown and is still passing a lingering existence. Having done so, it at once commences to spin up, forming a relatively long cocoon that remains attached to the front part of the caterpillar or to some object near to hand.

The dipterous parasites are various true flies belonging to the family Tachinidæ. Seven different parasites of this group have been bred in the United States alone from the Boll Worm Caterpillar.

(4) DISEASES.—There is again a bacterial caterpillar malady that may attack the Boll Worm Caterpillar. It is apparently identical with the disease of this nature that in Queensland is associated with the Army Worm (*Leucania unipuncta*) with such fatal results. These, however, are alone realised when the insects are numerous and the weather is wet or humid.

PARASITES IN CONTROL.—The value of these natural checks on this Cotton Boll Worm, *Chloridea obsoleta,* may be inferred from the following statement that relates to the first-mentioned class only:—

"Summarising the conclusions to be reached from a study of the insect parasites of the Boll Worm, it is evident that the destructiveness of the third and fourth generations is materially lessened by them.

During September, 1904, when the fourth generation should have been damaging much of the late cotton in Northern Texas, it was almost impossible to find any Boll Worms on cotton, and the few to be obtained in the neighbouring alfalfa fields were invariably attacked by parasites. At the same time, adult specimens of Micropolitis could almost always be collected in these locations by the use of the sweep net. Meanwhile, the late corn nearby where the parasites could not get at the larvæ was badly damaged. Such evidence plainly suggests that the dearth of larvæ on cotton at this time must have been, in a measure at least, due to the good work of parasites'' (Quaintance and Brues).

There is the further significant pronouncement emanating from Hawaii:—

''The Cotton Boll Worm of the Southern States, *Heliothis obsoleta,* has not as yet been found to attack cotton here. It often infests corn, and has occasionally been bred from other plants. Its parasites are so efficient that it is not expected it will become an important factor in our cotton production (D. T. Fullaway, 1909). This latter conclusion has an added interest, since the state of things revealed is evidently one of the outcomes of the extensive transmission on the part of Albert Koebele of parasites of all classes of insects into the Hawaiian Islands from various exotic regions.''

With respect to Queensland, and the noteworthy attacks on its cotton crops in many districts by the injurious insect under consideration, we have yet to learn whether insect parasites occur in association with it or not. So far, our only very limited observations have brought to light one of those mentioned, the parasite of the caterpillar itself—the Braconid fly, *Micropolites nigipennis,* or a species closely allied to it. This occurred affecting some Boll Worms obtained by an assistant, Mr. W. A. T. Summerville, near Ipswich, South Queensland.

It is desirable, therefore, that this cotton pest be further looked into from this particular standpoint. Should investigations tend to indicate that already many different kinds of parasites occur affecting the Boll Worm, we may then conclude that the severe injury to cotton is a transient event due to some natural factor prejudicially affecting their numerical development or virility. Should, on the other hand, they reveal their comparative absence, then the expediency—in what has been above stated—will suggest itself, of securing these enemies of *Chloridea obsoleta* that already occur in other countries for the behoof of our cotton-growing industry here, in thus controlling one of the principal of its insectifoes.

(5) PREDATORY INSECTS.—The insect has many predators in its own class. It would unduly extend this article to particularise here. However, it may be mentioned that the caterpillars themselves are inveterate cannibals, and that this fact alone accounts often for marked decrement in their numbers. This is a form of natural control that cannot be practically exploited however.

(6) BIRDS.—The services of birds in controlling the pest cannot be too strongly emphasised, and are most serviceable when the land is being prepared for the crop. This applies both to domestic poultry and indigenous native birds, especially magpies, crows, magpie larks, pee wits, and other ground-feeders. Their preservation should be the cotton-growers' special care.

It is a matter for consideration whether the general use in the field of well-stocked travelling poultry-houses, a procedure developed by the present writer in his schemes for subduing the "Grub" (*Scarabæid larva*) of sugar-cane in Queensland, would not prove of inestimable benefit in reducing also the soil-frequenting insects in our cotton-growing areas also—and the insect under notice is, temporarily at least, one of them.—H.T., 5-2-1923.

Description of Plates 51 and 52.

PLATE 51.—*Chloridea obsoleta*, Say (Heliothis armigera, Hübner) showing three phases in its life-history—the egg phase omitted. Also showing mode of occurrence of insect, and character of injury to Cotton plant.

PLATE 52.—The same. Showing in further detail the injurious relationship between the Caterpillar ("Worm") and the Cotton Flower—figs. 1-17; ditto Cotton flower-bud ("Square")—figs. 8-13 and 15; and ditto Cotton seed capsule ("Boll")—fig. 21; the general size of the insect as associated with the several injuries effected; and the Eggs magnified—fig. 14.

NOTE.—These Plates are reproduced from the "Fourth Report of the United States Entomological Commission," by Charles V. Riley, Ph.D., Chief, Washington, D.C., 1885.

Plate 51.—The Boll Worm (*Heliothis armigera.*)

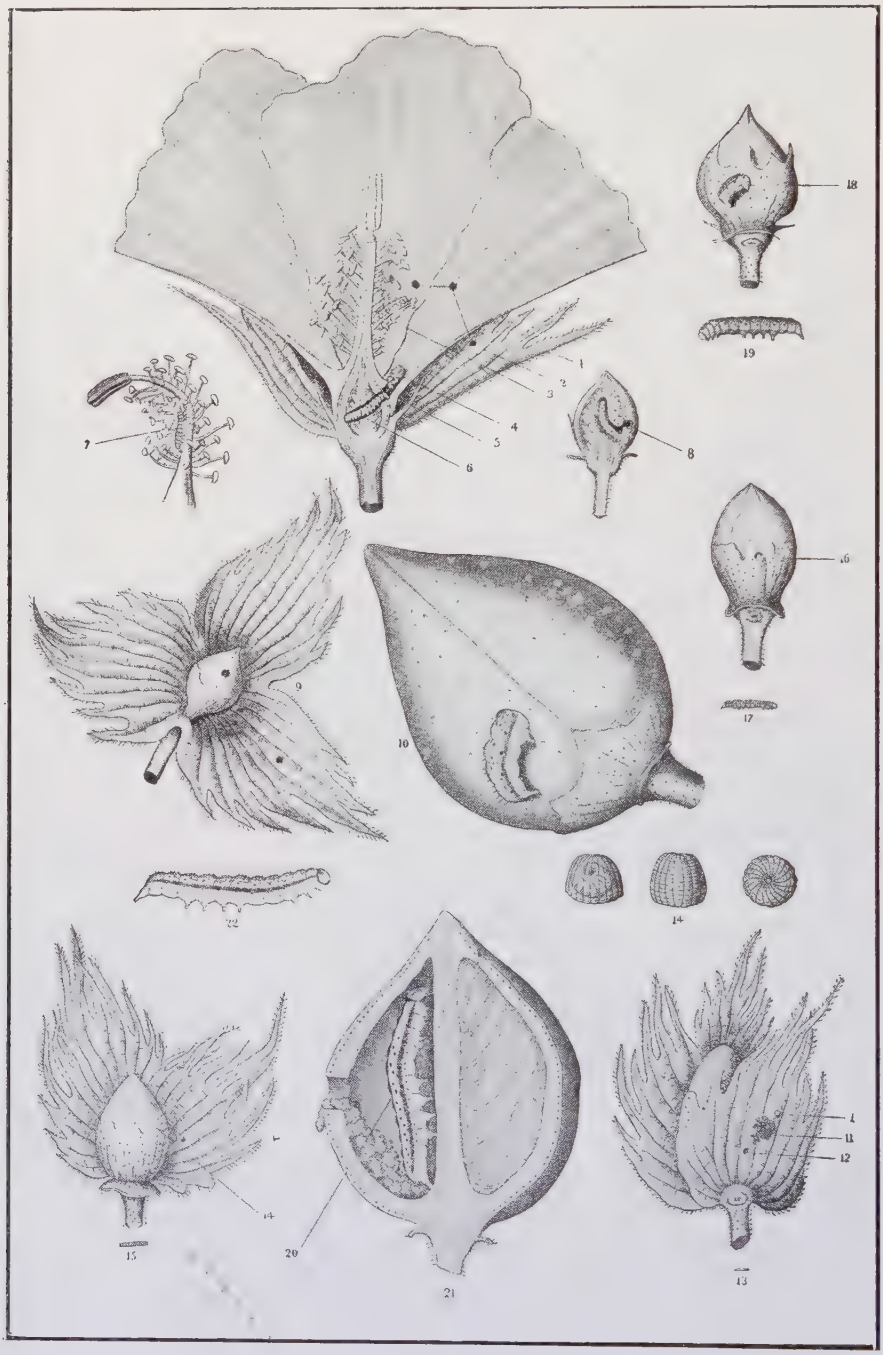

PLATE 52.—THE BOLL WORM (*Heliothis armigera.*)

THE QUEENSLAND COTTON INDUSTRY.

By W. G. WELLS, Cotton Adviser, Department of Agriculture and Stock.

The continued dry spell might nearly be described as a blessing in disguise to the cotton industry, because it has brought out many important facts which seem to have been overlooked in the growing of last season's crop, due in a great measure to the very favourable weather conditions which then existed at the critical period in the growth of the plants. The heavy rains of December and January of last season have confused many people in the formation of their ideas regarding the cotton plant, such as the types of soil best suited to cotton culture, the time and methods of preparing the soil, when to plant, when and how to thin, and the cultivation of the soil after the plants are of sufficient height to allow of it. Owing to the rank growth secured on some of the late-planted crops on very rich soils, many of the growers formed the opinion this year that the poorer classes of soil are the most suitable for cotton-growing. This may be true in localities favoured by heavy and continuous rainfall, where it would be necessary to restrict the growth of the plants; but from observations made this year it does not seem to hold true throughout the cotton sections.

A Southern Soil Survey.

Through most of the southern district, away from the coast, the sandy loams of good fertility and high moisture-carrying possibilities, and the alluvial loams, appear to be well suited to cotton-growing. The heavier soils, while capable of producing good cotton, have been handicapped, not only from the lack of rain during the growing season, but also by the dry winter of last year. Such soils appear to require a thorough saturation of the subsoil before they are capable of carrying a cotton crop to maturity in a season like the present one. Along the coast in average seasons it is probable that the low, well-drained ridges of soils of a loamy nature will give the best results, as there may be danger of too rank a growth being obtained on the richer creek "flats" and soils of that nature during the rainy season. This danger may be overcome by planting at the proper time, and by properly spacing the plants and rows, and it is advised that any grower planting on such land should experiment with time of planting, different widths between the rows, and different distances between the plants, in order to find the proper combination for his soil.

The Soils of the Central District.

Several types of soil appear to be well adapted to cotton-growing in the Central districts, such as the softwood scrubs on both the red and brown soils, the well-drained alluvial soils, and the low ridges of loams and sandy loams. The heavy soils in this district, as in the Southern district, have remarkable moisture-carrying possibilities when the subsoil has been thoroughly wet and good mulches maintained to reduce the evaporation. A thorough mulch is highly desirable on this type of soil, due to its tendency to crack open during the drought.

The Necessity of Thorough Cultivation.

The results obtained by some of the growers this year, even under the severe weather conditions, show the necessity of thorough preparation of the seed-bed before planting. Early ploughing, followed by at least one deep cross-ploughing later on, appears to be highly beneficial, as such a system this year seems to have reduced the amount of weeds and grass and has enabled the rooting system to penetrate deeply in search of moisture, with a consequent ability on the part of the plant to withstand the drought better and also to develop a better crop of bolls containing fibre of good strength and length. Much of the land growing cotton has not been cultivated before, and a thorough æration of such soils is highly desirable, as they are often of a "sour" nature. It is recommended, wherever possible, to plough at an early date any land which is to be planted to cotton next year. This is especially true of any land being broken for the first time, as it puts the soil in shape to allow a good penetration of any rains which may fall from now on. By thoroughly harrowing after any soaking rains the moisture is conserved, so that the subsoils contain a good degree of moisture and the growths of the weeds and grass are also checked. Later on in the season this land should be cross-ploughed to a depth of at least seven inches, and then be kept in a good state of tilth until planting time. This last ploughing should be done at least a month before planting time in order to allow the soil to settle into a firm seed-bed. In several instances this season it was observed that the seed was being sowed at the time of ploughing. This system should be thoroughly condemned, as it does not allow a thorough preparation of the seed bed, and, when the seeds are dropped in the furrows, it does not allow an average depth of planting.

Seed-Bed Preparation.

Too much attention cannot be paid to the preparation of the seed-bed. The faulty methods of many of the growers of this season are in a great measure responsible for the present condition of the crop. It is true that the drought and insect pests have severely handicapped a good percentage of the crops, but in nearly every section crops have been found which have been grown under a system of thorough preparation of the seed-bed and a maintenance of a clean cultivation after planting. These crops have been badly damaged by the maize grubs in some cases, but without this damage excellent crops would have been produced, even under the droughty conditions existing this year, as is shown by the yields on crops which have escaped the grubs.

By an early and thorough preparation of the seed-bed the grower is in a position to benefit by any good rains in September and to plant during that month, which, from the results obtained this year, seems to be desirable. With a firm, deeply prepared seed-bed, with moisture in the subsoil, any cotton planted after a rain during September is in a position to develop an excellent type of stalk and fruiting system if the proper methods of thinning and cultivation are observed. Many fields of such nature were observed this season, before the December rains came on, which were well laden with bolls and squares, while the neighbouring fields, which had been prepared poorly and planted later, were suffering from lack of moisture and had only a small percentage of the crop which the older and better-prepared fields contained.

Early Planted Crops.

The argument has been advanced that there is the danger of the lower crop of bolls on the early planted crops opening during the rainy season in January, with a consequent chance of their being destroyed by the rains. It is true that along the coast and in some of the more heavy rainfall sections of the inland country there is some danger, during periods of excessive rainfall, that the first few bolls may be mildewed or destroyed by the rains, but there are other factors which should be considered. An early planted plant has a tendency to develop a better fruiting system than later-planted plants, as the fruiting system is being developed in the cooler weather when the growth of the plant is slower, and consequently more fruit is borne on such stocky-type plants than on the faster-developing more slender type of plants of the later plantings. This ability to develop an early crop is highly desirable, even if part of the lower bolls are destroyed, as the crop of bolls acts as a check on too rapid a growth of the plant during any periods of excessive rainfall, which is beneficial, not only in that a type of plant is developed which is more easily picked, but the danger is restricted of such rank growth of plant being developed that any late heavy rains might seriously damage a good portion of the lower crop, due to the inability of the sunlight to penetrate through the heavy foliage and dry out the opened bolls.

Dry Farming Methods.

The impression prevails that cotton is distinctly a dry-weather plant, but, while it resists the drought and heat much better than many agricultural crop plants, it is highly essential that sufficient moisture be obtained at the period when the bolls are developing to the extent that they are utilising a large percentage of the moisture secured by the plant. The present drought has brought out this fact very forcibly, and many of the growers have learned that the best of "dry farming" methods must be employed in order to insure a retention of sufficient moisture in the soil to develop a profitable crop.

The Effects of Close Spacing.

Last year many crops were left unthinned, and the heavy rains which fell during December and January were able to carry the plants to the maturity of a large crop in many cases. This, and the fact that some of the late-planted crops which were spaced a little too wide on very rich soils, and consequently made a very rank growth without much of a crop, led many growers to believe that close-spacing in the row, and in many cases no thinning at all, was highly desirable. Crops treated in such a manner this year are showing the evils of such a system, in that a large percentage of the bolls and flowers has shed during the last month, and that the bolls which have remained on the plant are of small size and in many cases are being forced open prematurely, with a consequent checking of the development of the strength and length of the fibres. The root system of a cotton plant is capable of spreading to only a certain degree, and in periods of drought, such as the present crop is going through, it can be easily seen that the plants should be spaced out sufficiently to allow them to secure the maximum amount of available moisture. This should not be carried out to too great an extreme, as any distance wider than this is simply reducing the amount of the crop under average seasonal conditions. This thinning should be done when the plants are small,

before the competition for the soil moisture has become so severe that the plants are partially checked.

A Difficult Problem.

The yearly fluctuations of the amount of rainfall through most of the cotton sections of Queensland are so great that it is going to be a difficult problem to secure the maximum yields of cotton which the soils may be capable of producing. With this in mind, the grower should study his methods of spacing and thinning, with the idea of producing a good average crop year after year rather than the maximum crop for every year. As is seen this year, the methods last year under good rainfall conditions are failures this year under very droughty conditions. The grower should attempt to perfect a system which will yield a paying crop under droughty conditions and still yield well under very heavy rainfall conditions. This can be accomplished only by the grower adopting the best of farming practices and then experimenting on the average of his soils until he is satisfied of having secured the best system.

Small Areas Tilled Properly Better Than Large Tracts Farmed Badly.

Too little attention has been paid to the cultivation of the crops this year. Many of the growers have had too large an acreage to handle efficiently with the amount of labour at their disposal. It will be far better, both for the grower and the future of the cotton industry in Queensland, if the grower attempts to grow only what he can take care of properly. To many, a cotton boll is just a cotton boll, and it is not realised that even if the boll does look large and well-opened it may contain short weak fibre or long strong fibre, depending on how it is grown. Plants which have been choked out by the weeds and have forced their crop open by the lack of moisture certainly cannot be expected to produce as good fibre as well-grown plants which have had sufficient moisture to develop their crop normally. If faulty methods of cultivation are going to persist, the standard of Queensland cotton cannot be kept up, even with the best of adapted varieties, unless the climatic conditions are exceptionally favourable.

An Encouraging Factor. A Promise of Profitable Yields.

The degree to which the well-grown early planted cotton has stood up this year is very encouraging indeed, and it is anticipated that, when better farming practices are adopted as a whole, the cotton crop of Queensland can be depended on as a profitable industry, even under severe drought conditions. The present crop in good condition in most sections still has sufficient time to develop a surprisingly good yield if the rains start at an early date. If the growers take advantage of these rains and prepare a thorough mulch in any of the crops which are not too high to put the scarifier through, it is anticipated that profitable yields may be secured on the late-planted as well as on the older crops.

REGULATIONS REGARDING COTTON PESTS AND DISEASES IN BRITISH COLONIES AND INDIA.*

In 1910, the Pink Boll Worm was known to exist in India, German East Africa, British West Africa, and Hawaii. In 1922, it was recognised in Egypt and the Sudan, Mesopotamia, Brazil, Peru, Mexico, the United States, and the West Indies. In fact, almost every country growing cotton had been infected with it with the exception perhaps of Turkestan, Uganda, Nyasaland, and South Africa. The spread of the pest was chiefly due to the transport of infected cotton seed often contained in bales of ginned cotton, and has necessitated legislation, which, in nearly every case, has, unfortunately, been effected rather too late to secure freedom from attack.

India—Bombay.

By "*The Destructive Insects and Pests Act of* 1914" the Governor in Council has the power of regulating or prohibiting the import of material likely to carry infection, and on the 7th November, 1917, the Governor in Council issued an order that seeds of cotton should not be imported by land or by sea, by letter or sample post; and again that cotton seed should not be imported by sea except after fumigation with carbon-bisulphide at a prescribed port.

Madras.

By "*The Madras Agricultural Pests and Destruction Act of* 1919" the Governor has directed that all Cambodia cotton plants in certain specified districts shall be pulled completely out of the ground and allowed to wither before the 1st August in

* Summarised from article in Bulletin No. 2, volume 20, page 192, of the Imperial Institute.

each year. The reason for this notification was that the stem weevil and the Pink Boll Worm were established as pests in respect to Cambodia cotton. This effect was brought about by the fact that Cambodia cotton was treated as a biennial and perennial crop, and had thus favoured the spread of the two insect pests which have now become serious. It is therefore proposed to limit the cultivation of this, as well as all other cotton, to a single year, and to arrange for a certain close time during which there will be no cotton-growing.

Burma.

The only regulation affecting cotton pests which is in operation in the country is the Government of India's notification of the 7th November, 1917, by which, under powers of Act of 1914, the Governor in Council issued a general order which is being observed in Burma at the present time, and which deals with the control of imported seed.

Bihar and Orissa.

The importation of cotton seed is controlled.

Assam.

The importation of cotton seed is controlled by regulation, but, as a matter of fact, as the inhabitants use their own seed, they do not import.

Uganda.

The Uganda Cotton Amendment Ordinance of 1920 provides for the following:—

The distribution of cotton seed for sowing purposes shall be under the sole control of the Government.

The Director of Agriculture shall have the power to requisition any cotton seed considered suitable for sowing, and such seed shall be handed over free of all costs.

Cotton seed obtained from hand cotton gins shall forthwith be destroyed unless it is to be subsequently handed over to the Government.

All cotton plants shall be uprooted and destroyed after the first season's crop has been picked, and on no account shall they be allowed to remain for a second season or for more than one year in the ground.

The Director of Agriculture may notify a date prior to which all the previous season's cotton plants must be uprooted and destroyed in any district.

This Ordinance came into force on the 1st January, 1921.

Anglo-Egyptian Sudan.

Ordinance No. 7 of 1907 has reference to locust destruction, a most important regulation where young cotton is liable to be attacked. Where locusts have deposited their eggs in cotton land, the land must be worked with a "fass" as thoroughly as possible without uprooting the plants. The penalties vary from a fine not exceeding £2 or imprisonment not exceeding thirty days, or both, to a fine of £5 or imprisonment up to two months, or both.

By the Plant Diseases Ordinance of 1911 the Governor-General is given powers to proclaim a disease, order the destruction of diseased articles, and quarantine imported plants, and co-operate with the Postal and Customs officials. The diseases proclaimed include the Pink Boll Worm.

Another order published in 1917 prohibits the transportation of cotton seed, seed cotton, cotton lint, cotton plants, and any parts thereof from the Red Sea Province into any other part of the Sudan, except under the authority of the Director of Agriculture.

A further order of 5th December, 1918, prohibits the importation of growing plants into the Sudan, but allows the entry of such plants from Egypt under stringent conditions.

The Cotton Ordinance promulgated in November, 1912, prohibits the importation of cotton seed, except under a permit granted by the Director of Agriculture. No cotton seed may be used for sowing unless it has been approved by the same authority. Cotton shall be picked clean, free from leaves, bolls, and dirt, and none but clean cotton shall be sold or offered for sale. No cotton is to remain on the land longer than the one season. By the Cotton Regulations of 1913, all cotton plants shall be destroyed in certain specified districts before the dates given in each year.

Another paragraph in the regulations compels occupiers of cultivated land in the Tokar Plain to destroy all noxious weeds and other plants likely to harbour pests on their land.

Cotton Regulations published in March, 1917, gave the Director of Agriculture permission to alter the date before which all cotton plants, stalks, bolls, or parts of plants shall be destroyed by the owner. They also regulated the removal or destruction of all waste cotton seed, &c., from a ginning factory likely to harbour the Pink Boll Worm, and made it only permissible to store cotton seed in a ginnery after the ginning has been finished for the season where the doorways, windows, and other openings are covered by wiregauze mesh which will prevent the egress of the moth of the Pink Boll Worm.

The Pink Boll Worm having been found in Tokar cotton seed, it became urgent that steps should be taken to prevent seed cotton or cotton seed grown in the Tokar district from being transported into the other districts, and great care is exercised in this matter.

Nigeria.

Under an Agricultural Ordinance promulgated in 1916 the Governor in Council may make regulations to prevent the introduction or spread of pest, for regulating the sowing, collecting, ginning, or other preparation of cotton, and for prohibiting any importation or the sowing of any particular kind of seed or specifying any particular kind of seed as the only kind to be imported or used.

An Ordinance issued in 1917 provides that all cotton seed must be imported through the port of Lagos, where, after inspection, it may be admitted, disinfected, or destroyed. In 1918, regulations were issued making it an offence to mix American with native cotton.

By a Native Court rule of the Zaria Province of October, 1916, it was made a punishable offence to plant any but Government seed, or to mix cotton grown from Government seed with native cotton. A similar rule was made in July, 1920, in respect to the Court of the Sokoto Province. These rules seem to have little to do with the prevention of pests and fungi, but are practical guarantees that the seed is free from attack and that the crop is reasonably safe.

By a Regulation of 1920 the Governor shall declare what are the American cotton areas in which no other cotton may be cultivated, and, except in such parts of certain provinces as are not declared to be American cotton areas, the owner or occupier of any land in Nigeria on which cotton or any cultivated species of Hibiscus exists shall uproot and burn all plants of either group before certain specified dates.

Gold Coast.

The importation of seed is regulated.

West Indies.

In the Leeward Islands the importation of cotton seed and seed cotton from Antigua is prohibited.

In the Virgin Islands the importation of cotton seed has been prohibited since October, 1920. By a Cotton Ordinance of 1914 cotton plants in Montserrat are not allowed to remain in the soil longer than one season. By the Cotton Stainer Ordinance of August, 1918, all cotton-growers are compelled to destroy the cotton stainer met with in or about any cotton storehouse.

By an Ordinance of 1919 the Governor in Council of Montserrat may declare a close season for cotton in that island, and the occupier of any land in the cotton district must, before the first day of the close season, burn or bury any cotton plants on that land. The planting of cotton is prohibited during the close season.

In St. Kitts and Nevis an Ordinance was passed in 1918 providing for the eradication of cotton stainer. The Governor of St. Kitts is also empowered to fix close seasons. The importation of cotton seed is prohibited, except from certain specified places.

For Antigua, during 1919 and 1920, Ordinances were issued dealing with cotton stainer, close seasons, and prohibiting the importation of seed.

In St. Vincent an Ordinance was issued in 1911 providing for the destruction of old cotton plants and preventing cotton being grown as a biennial plant. In February, 1918, an Ordinance was issued dealing with cotton planted outside the cotton season, and imposing penalties on anyone who planted at any other than the defined period. In 1917, the importation of seed cotton or cotton seed was prohibited, and the prohibition was extended to any bags or packages that had been used for cotton seed or seed cotton.

Nyasaland.

In May, 1920, an Ordinance was issued providing for the destruction of cotton bushes in order to prevent their being grown in more than one season, and which prohibited the distribution to natives of cotton seed which has not been approved by the Director of Agriculture.

Rhodesia.

Cotton seed can only be introduced under the permission of the Director of Agriculture.

Union of South Africa.

By Proclamation of 15th January, 1921, the importation of cotton seed with lint attached and cotton lint in which any cotton seeds are contained is prohibited.

Tanganyika.

Power is given to the Governor to make rules for the inspection of cotton seed and cotton plantations for the eradication of diseases and insect pests. Cotton seed can only be imported under a license obtained from the Director of Agriculture. The Director has power to requisition and distribute seed from any plantation, and no native is allowed to grow cotton from any seed which has not been approved by the Director of Agriculture. Everyone growing cotton shall give notice if he finds disease in his plantation.

No cotton plant is to remain in the ground beyond one year, and the Director of Agriculture may fix a date prior to which all the previous season's cotton plants shall be uprooted and burned. When disease is found to exist in any plantation the Director may order all the cotton plants to be burned, the plantation to be deeply tilled, and no cotton to be replanted for two years.

WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

No. 29.

SOLANUM SEAFORTHIANUM.

Description.—A rather slender perennial climbing plant, quite glabrous in all parts. Leaves 3-6 inches long, the upper part deeply 7-9 lobed, the terminal lobe the largest, the lowermost lobes usually very small, the lower part consisting of a slender petiole (stalk). Flowers of a lilac colour, borne in terminal bunches (panicles) of 2-4 inches. Calyx green with 5 short teeth. Corolla when expanded nearly 1 inch in diameter, deeply divided into 5 spreading lobes. Stamens 5, anthers bright yellow. Style slender, pale lilac colour, 4 lines long. Berries bright red (deep scarlet), globose ½ inch in diameter, borne in profusion.

Distribution.—A native of the West Indies and tropical America; of late years it has run out in several localities in Queensland. It is very abundant at Theebine and Kanyan (Wide Bay district), Atherton Tableland (North Queensland), and other places overrunning the "scrub" edges and secondary growths.

Common Name.—It is sometimes called "Deadly Nightshade," a name, however, applied in Queensland indiscriminately to a number of plants of the family *Solanaceæ*.

Botanical Name.—Solanum, derivation doubtful; *Seaforthianum,* after Lord Seaforth, who introduced the plant into English gardens in 1804.

Poisonous Properties.—A couple of years ago specimens of this plant were sent me from Springsure with the report that two children had seen the plant growing wild and had eaten some of the berries. They were later taken violently ill and were admitted to the Springsure Hospital; both recovered.

The berries are often accused of causing the death of fowls, and in this Journal for April, 1918, an account is given by H. Tryon of the deaths of fowls caused by eating the berries of this plant. (He refers to it as *S. jasminoides* and later as *S. Seaforthianum—Seaforthic* by a misprint—and from the description this latter species is evidently the one meant.)

The plant is evidently eaten freely by fruit-eating birds, as can be seen by the way it is carried from one place to another; it is possible that some birds can eat the fruit with impunity. I have heard that ducks eat them freely without ill effects following, but this needs confirmation.

Eradication.—So far it has not manifested itself as a bad weed in cultivation or pastures. It grows freely in scrub areas, and when the scrub is felled may come up thickly enough to prevent a good burn. Growing as it does also on the edges of scrubs, the bright berries are attractive to children, who might eat them with fatal results. In such situations as these spraying with an arsenical solution and later burning the plants should prove effective. It would probably have to be done several times, as additional plants come up after the burning off.

Botanical References.—Solanum Seaforthianum, Andr. Bot. Repos, p. 504; *S. prunifolium,* Willd., ex O. Sendtner in Mart. Flora Bras. X 15.

Photo : Dept. Agriculture and Stock.]

PLATE 53.—SOLANUM SEAFORTHIANUM.

(The measurement at base represents 1 centimetre—nearly ½ inch.)

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1923.

The weather throughout the month was very hot, and gave to competition birds a trying time. It has had a great effect on the birds that are coming into moult, and with many it also had a tendency to decrease the number of eggs laid during the month causing a great slowing down in their egg production. The following are the leading layers for February:—Light breeds—G. and W. Hindes, 117, followed by C. H. Singer with 116 eggs. In the heavy breeds R. Burns takes the lead with 121 eggs. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
	LIGHT BREEDS.		
*N. A. Singer	White Leghorns	108	1,491
C. H. Singer	Do.	116	1,442
*W. and G. W. Hindes	Do.	117	1,363
*Bathurst Poultry Farm	Do.	103	1,259
*R. Gill	Do.	94	1,227
*S. L. Grenier	Do.	106	1,225
*J. M. Manson	Do.	107	1,215
*H. P. Clarke	Do.	110	1,204
*Mrs. L. Andersen	Do.	104	1,200
*W. Becker	Do.	105	1,200
*G. Trapp	Do.	82	1,197
*J. W. Newton	Do.	96	1,174
*W. A. Wilson	Do.	92	1,163
*G. Williams	Do.	89	1,119
*C. Goos	Do.	81	1,118
J. H. Jones	Do.	72	1,111
*R. C. J. Turner	Do.	96	1,105
*R. C. Cole	Do.	81	1,104
*F. Birchall	Do.	106	1,100
*Oakleigh Poultry Farm	Do.	86	1,100
A. G. C. Wenck	Do.	87	1,092
*O. Goos	Do.	85	1,070
*T. Fanning	Do.	42	1,053
*H. Fraser	Do.	82	1,051
N. J. Nairn	Do.	95	1,038
*Mrs. R. Hodge	Do.	44	1,036
*Thos. Taylor	Do.	100	1,033
*Mrs. E. White	Do.	81	1,022
*M. F. Newberry	Do.	85	1,013
*J. W. Short	Do.	72	1,010
*C. M. Pickering	Do.	81	988
T. H. Craig	Do.	60	984
B. Hawkins	Do.	65	979
*E. A. Smith	Do.	80	966
A. Maslin	Do.	75	960
J. Purnell	Do.	55	936
G. F. Richardson	Do.	76	913
E. Symons	Do.	73	898
H. Trappett	Brown Leghorns	86	898
E. Stephenson	White Leghorns	65	894
B. C. Bartlem	Do.	51	881
A. Anders	Do.	83	862
Brampton Poultry Farm	Do.	68	853
Parisian Poultry Farm	Brown Leghorns	44	574

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
HEAVY BREEDS.			
*R. Burns	Black Orpingtons	121	1,361
*A. E. Walters	Do.	72	1,144
*T. Hindley	Do.	69	1,089
*C. C. Dennis	Do.	87	1,080
*R. Holmes	Do.	86	1,054
Jas. Hutton	Do.	83	1,049
*E. F. Dennis	Do.	69	1,041
Mrs. A. Kent	Do.	54	999
*H. M. Chaille	Do.	70	988
Mrs. A. E. Gallagher	Do.	57	985
Mrs. L. Maund	Do.	90	966
R. Innes	Do.	63	959
H. B. Stephens	Do.	92	958
*Jas. Potter	Do.	70	928
*Parisian Poultry Farm	Do.	88	904
V. J. Rye	Do.	82	886
W. Becker	Chinese Langshans	60	876
*Rev. A. McAllister	Black Orpingtons	71	874
C. Doan	Do.	64	864
Wambo Poultry Farm	Do.	45	862
Jas. Hitchcock	Do.	42	808
C. Rosenthal	Do.	78	805
W. C. Trapp	Do.	61	745
R. Burns	Silver-laced Wyandottes	32	681
*J. E. Smith	Plymouth Rocks	51	620
*Miss L. Hart	Rhode Island Reds	20	513
Total		5,463	71,160

* Indicates that the pen is being tested singly.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total
LIGHT BREEDS.							
N. A. Singer	218	286	225	260	236	266	1,491
W. and G. W. Hindes	234	219	232	217	238	223	1,363
Bathurst Poultry Farm	170	198	224	220	246	201	1,259
R. Gill	226	219	226	213	153	190	1,227
S. L. Grenier	189	164	212	210	223	227	1,225
J. M. Manson	214	175	204	189	226	207	1,215
H. P. Clarke	199	189	195	218	199	204	1,204
Mrs. L. Andersen	230	171	209	195	208	187	1,200
W. Becker	199	169	207	197	204	224	1,200
Geo. Trapp	206	184	212	220	176	199	1,197
J. W. Newton	207	202	227	185	198	155	1,174
W. A. Wilson	202	183	158	208	200	212	1,163
C. Williams	174	192	210	197	185	161	1,119
C. Goos	138	177	184	202	235	182	1,118
R. C. J. Turner	193	163	202	190	196	161	1,105
R. C. Cole	220	165	206	158	179	176	1,104
F. Birchall	183	209	157	135	218	198	1,100
Oakleigh Poultry Farm	195	160	197	174	177	197	1,100
O. Goos	181	166	193	208	192	130	1,070
T. Fanning	133	172	193	172	235	148	1,053
H. Fraser	179	201	174	151	155	191	1,051

EGG-LAYING COMPETITION—*continued.*

DETAILS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued*							
Mrs. R. Hodge	207	137	171	155	220	146	1,036
Thos. Taylor	187	145	184	178	177	162	1,033
Mrs. E. White	196	110	214	141	153	208	1,022
M. F. Newberry	174	146	156	218	137	182	1,013
J. W. Short	165	162	191	156	169	167	1,010
C. M. Pickering	197	196	111	161	167	156	988
E. A. Smith	155	157	170	176	140	168	966
HEAVY BREEDS.							
R. Burns	220	220	211	252	222	236	1,361
A. E. Walters	188	157	153	196	241	209	1 144
T. Hindley	154	186	120	238	231	160	1,089
C. C. Dennis	183	188	188	161	184	176	1,080
R. Holmes	132	202	187	174	175	184	1,054
E. F. Dennis	150	177	197	110	197	210	1,041
H. M. Chaille	174	167	187	150	191	119	988
J. Potter	158	167	173	144	170	116	928
Parisian Poultry Farm	110	147	177	119	172	179	904
Rev. A. McAllister	158	174	159	107	89	187	874
J. E. Smith	76	118	97	86	106	137	620
Miss L. Hart..	81	109	64	109	74	76	513

CUTHBERT POTTS, Principal.

PLATE 54.—THE STANTHORPE TOMATO POOL BOARD.

Front row : Messrs. S. R. Mitchell, W. H. Passmore (Chairman), W. H. C. Laird.

Back row : Messrs. M. E. Sewell, H. S. Dawkes (Secretary), A. E. Watts, J. S. Mehan (Manager).

NATIONAL UTILITY POULTRY BREEDERS' ASSOCIATION COMPETITION, ZILLMERE.

Some extremely hot weather was experienced during February, and there was a falling-off in production, 1635 eggs being laid, an average of 14 per bird. Two deaths occurred, Messrs. Kidd Bros.' No. 86, Black Orpington, died from rupture, and Mr. L. Andersen's No. 19, White Leghorn, succumbed to bowel trouble. Nos. 82, 101, 110, and 112 were broody.

Pen No.	Owner.	Feb.	Total.	Pen No.	Owner.	Feb.	Total.
	WHITE LEGHORNS.						
43	J. Davies	22	272	58	M. Newberry ...	8	206
29	A. S. Walters ...	18	267	19	L. Andersen ...	0	205
66	A. Cowley ...	21	261	9	P. Ruddick ...	13	204
2	A. Niel	1	256	57	M. Newberry ...	15	204
64	G. Trapp	21	255	20	L. Andersen ...	19	202
62	H. Sturman ...	20	251	30	A. S. Walters ...	13	200
34	J. Purnell ...	20	250	22	E. Stephenson ...	15	198
7	J. Harrington ...	19	247	73	A. F. Knowles ...	15	195
27	Oakleigh Poultry Farm	17	246	14	J. Hutton ...	18	195
				76	A. J. Bourne ...	13	192
70	A. Hodge ...	20	245	8	J. Harrington ...	8	192
53	A. W. Ward ...	21	241	36	Parisian Poultry Farm	16	190
39	P. J. Fallon ...	22	239				
25	P. F. Adams ...	17	238	16	T. Flood	17	190
63	G. Trapp	20	238	80	W. Bliss	19	190
13	J. Hutton ...	22	238	78	Kelvin Poultry Farm	20	188
68	R. D. Chapman ...	23	238				
79	W. Bliss	22	237	17	R. Shaw	3	187
77	Kelvin Poultry Farm	17	235	6	Wambo Poultry Farm	0	186
61	H. Sturman ...	18	235	11	J. Potter	15	184
72	Enroh Pens ...	13	232	81	E. C. Raymond ...	18	184
12	J. Potter ...	14	232	5	Wambo Poultry Farm	17	182
52	F. R. Koch ...	20	232				
55	W. H. Lingard ...	20	230	3	W. Becker ...	18	182
44	J. J. Davies ...	19	229	31	R. H. Woodcock	18	181
33	J. Purnell ...	11	224	59	C. Pickering ...	22	180
67	R. D. Chapman ...	19	224	38	Carinya Poultry Farm	0	179
40	P. Fallon	22	224				
10	P. Ruddick ...	18	223	82	E. C. Raymond ...	6	179
54	W. Ward ...	19	221	48	M. J. Lyons ...	0	176
24	M. H. Campbell...	19	220	65	A. Cowley ...	10	175
46	H. Needs ...	18	219	15	T. Flood	14	166
58	M. Newberry ...	21	219	71	Enroh Pens ...	12	163
23	M. H. Campbell...	23	219	75	A. J. Bourne ...	17	161
26	P. F. Adams ...	19	218	50	R. Turner ...	14	160
18	R. Shaw	19	211	60	C. Pickering ...	10	156
35	Parisian Poultry Farm	18	210	45	H. Needs ...	5	155
				4	W. Becker ...	14	152
56	W. H. Lingard ...	19	209	69	A. Hodge ...	3	135
49	R. Turner ...	10	209	32	R. H. Woodcock	12	128
37	Carinya Poultry Farm	20	209	74	A. F. Knowles ...	0	123
				28	Oakleigh Poultry Farm	0	107
47	M. J. Lyons ...	12	208				
41	G. Williams ...	17	208	1	A. Niel	15	42
51	F. R. Koch ...	18	207				

NATIONAL UTILITY POULTRY BREEDERS' ASSOCIATION COMPETITION, ZILLMERE—*continued.*

Pen No.	Owner.	Feb.	Total.	Pen No.	Owner.	Feb.	Total.
	BLACK ORPINGTONS.						
92	C. C. Dennis ...	22	263	86	Kidd Bros. ...	9	179
88	W. A. Blake ...	22	259	112	A. Niel	8	178
96	R. A. Boulton ...	10	245	106	H. Pearce ...	14	174
93	E. F. Dennis ...	24	244	104	J. Potter	4	173
91	C. C. Dennis ...	22	233	102	Parisian Poultry Farm	0	167
108	E. Walters ...	21	232				
89	T. Brotherton ...	23	225	109	Wambo Poultry Farm	0	165
107	E. Walters ...	6	215				
95	R. A. Boulton ...	9	214	83	J. Hutton ...	0	157
111	A. Niel	22	212	98	Enroh Pens ...	17	157
105	H. Pearce ...	17	210	97	Enroh Pens ..	17	156
101	Parisian Poultry Farm	9	200	110	Wambo Poultry Farm	13	155
103	J. Potter	10	197	90	T. Brotherton ...	9	151
84	J. Hutton ...	14	187	99	L. J. Pritchard ...	1	131
100	L. J. Pritchard ...	8	184	94	E. F. Dennis ...	0	114
87	W. A. Blake ...	9	183	85	Kidd Bros. ...	0	10
	OTHER BREEDS.						
120	T. J. Carr (S.W.)	20	209	114	Parisian Poultry Farm (B.L.)	12	166
119	T. J. Carr (S.W.)	21	203				
116	G. and W. Hindes (B.L.)	15	188	113	Parisian Poultry Farm (B.L.)	3	136
118	J. H. Jones (W.W.)	0	176	118	J. H. Jones (W.W.)	0	120
115	G. and W. Hindes (B.L.)	22	174				

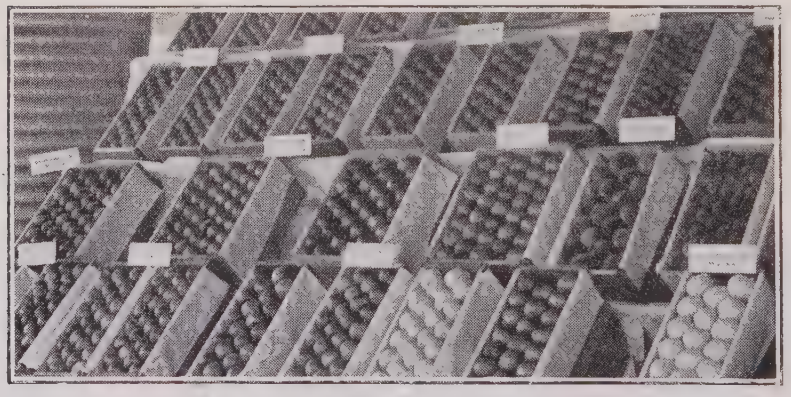

PLATE 55.—SECTION OF DEPARTMENT OF AGRICULTURE'S EXHIBIT AT THE STANTHORPE SHOW.

A valuable lesson in methods of fruit packing.

General Notes.

Regulations Under the Pools Act.

Additional regulations have been promulgated under "*The Primary Products Pools Act of* 1922." These provide that a Pool Board shall conspicuously display, at least every month in the Board's public office, a full and explicit statement of the Board's receipts and expenditure, stock transactions, and liabilities for the period since the last previous statement was so displayed. At least every year there shall be similarly displayed a full and explicit balance-sheet of the Board. These statements are to remain displayed until they are replaced by their successors, and shall be available for perusal and copying at reasonable hours by any person.

Departmental Appointments.

The following appointments have been made:—

Bessie Wolstenholme as Typiste.

W. A. R. Cowdry as Clerk.

F. B. Coleman as Inspector under the Fertilisers Act, the Pure Seeds Act, and the Stock Foods Act.

W. R. Straughan and O. L. Hassell as Agricultural Field Assistants.

R. G. S. Holt as Assistant to Bacteriologist, Townsville.

L. A. Burgess, Assistant to Analysts.

E. F. Duffy, Inspector under the Diseases in Plants Act.

F. G. Connolly as Assistant Instructor in Fruit Culture.

W. Ford as a Slaughtering and Brands Inspector.

W. C. Stables, of Yeppoon, as an Honorary Inspector under the Diseases in Plants Act.

Constables D. Pope, P. F. McIvor, and T. Caplice as Slaughtering Inspectors.

Constable P. Hogan and F. J. Baker (caretaker of Kirkland's Dip at Kynuna) as Stock Inspectors.

Sergeant Eric Stephenson as an Inspector under the Diseases in Stock Act and the Diseases in Plants Act.

The Nutmeg Pigeon.

The nutmeg pigeon of North Queensland has been added to the list of totally protected birds throughout the State.

State Insurance—Free Household Workers' Compensation Policies.

The Attorney-General (Hon. John Mullan) advises that the experience in connection with Household Workers' Insurance to date has been gone into by the Insurance Commissioner in connection with the preparation of the usual expiry notices to policyholders due to be issued shortly, and it has been found again that, as in the years ended 30th June, 1918, 1919, and 1921, the experience has been so satisfactory regarding this section of the business that expiry notices will be issued to policyholders shortly, stating that policies falling due on 30th June next, will be renewed free of any premium.

The Queensland Mangosteen.

For many years the United States Department of Agriculture sought for specimens of mangosteens with which to carry out cross-breeding experiments. The true mangosteen will not thrive even in subtropical climates, but it is thought that if a cross can be obtained with some varieties, such as are known to flourish on the Bellenden-Ker Range, North Queensland, a subtropical species might be evolved. The species referred to grow at high altitudes where temperatures naturally are much cooler than in plain tropics.

Two varieties are found on the range indicated—Garcinia Mestonii and Garcinia Gibbsæ. The first-named was discovered by Mr. Archibald Meston, and the latter by Miss L. S. Gibbs, of London.

The Queensland Department of Agriculture has devoted much attention to its native tropical fruits and was in a position to meet promptly the wishes of the United States authorities. The Queensland Government, on learning of the quest, decided to send an expedition to Bellenden-Ker for the purpose of securing seeds and plants for treatment. Mr. Cyril White, F.L.S., Government Botanist, and Mr. E. W. Bick, Curator of the Botanic Gardens, were entrusted with the task. The expedition was successful, and these two officers returned recently with about 400 seeds of each species.

One hundred and fifty of these seeds will be sent to America by the first opportunity. The remainder will be planted under glass in the Botanic Gardens. They will be artificially heated in winter, and when the plants have been sufficiently advanced they will be transported to America in special cases.

This is the first occasion on which the fruit of the Gibbsæ species have been collected, for the discoverer of the variety, the habitat of which is the Atherton tableland, contented herself with the flowers.

Messrs. White and Bick, who received valuable assistance from Messrs. Fraser and Merrotsy, forest rangers of the Atherton district, spent five days on Bellenden-Ker Range, finding the coveted fruit at elevations of from 1,500 to over 4,000 feet. The cyclone which swept across that very exposed region in 1918 had obliterated all traces of the old track up the eastern slope of the range, but the forest rangers had prepared another track, and personally conducted the botanists over the route. The weather proved delightfully fine, until the last day of their stay, when heavy rain drenched them. The nights were quite chilly.

Naturally this little-explored region proved a most interesting place to the botanists, who, while in special pursuit of mangosteens, kept their eyes widely open for any other rare specimens of plants. A number of these were secured, especially of the palm family, and it is believed that one or two species new to science have been obtained. These will be more closely examined and reported on in due course.

The mangosteen, contrary to its name, is not at all like a mango. It has the appearance of a green tomato, both in size and shape, and has a strongly acrid taste. So pronounced is this flavour in the case of the Gibbsæ species that even the hungry wild natives exclude it from their dietary.

Diseases in Plants—New Regulations.

Three new regulations have been added to the existing regulations under "*The Diseases in Plants Act of* 1916," whilst clauses 26-34 of the regulations dated the 12th January, 1917, and regulation No. 51 have been repealed. The new regulations number from 52 to 54.

Regulation 52 stipulates that no owner (or his agent) of an orchard shall permit any fruit, whether diseased or not, to be on the ground. He is required to gather all fruit that may drop to the ground and destroy such of that fruit that may be diseased by submitting it to the process of boiling, or as otherwise instructed by an inspector under this Act.

Regulation 53 deals with the codlin moth of pip fruit, and requires that orchards in which codlin moth is present shall be sprayed with an approved brand of arsenate of lead. The first spraying is to be given when the petals are falling from the flowers, and, if deemed necessary, a second and third spraying shall be given at intervals not exceeding three weeks from the time of the first application.

The first regulation also deals with the codlin moth and imposes upon the orchardist growing apple, pear, and quince trees the duty of keeping his orchard free from dead bark, broken limbs, props, or any other material likely to harbour the larvæ or pupæ of the codlin moth.

Australia's World Champion Butter Cow.

Australia now holds the world's record for the butter-fat production of a single cow, Melba XV. of Darbalara, a milking shorthorn, having produced 1,318·812 lb. of fat, equal to 1,586½ lb. of commercial butter, in 365 days. Her milk yield was 29,432 lb. This figure has been exceeded by several Friesian cows, but none of these has come within 60 lb. of Melba XV.'s butter production.

The Pineapple Crop—Ex-Soldiers' Distribution Scheme.

The soldier growers at Glass House Mountains are endeavouring to work out their own salvation. Their organisation, the United Fruit Growers' Association, has launched a distribution scheme by means of which they hope to place the greater part of their crop on the fresh fruit market at a price that will be fair to grower and consumer.

Every case of pineapples diverted from the canneries and sold as fresh fruit increases the return to the grower. It is obvious that a departure must be made from the obsolete marketing methods at present in vogue.

The growers of Glass House Mountains are translating the slogan of "direct from grower to consumer," into an accomplished fact. Cases of choice pineapples, 16 to 24 to the case, are being delivered to any address in Brisbane or suburbs for 6s., cases to be returned. Orders with cash are being received at the State Trade Office, Treasury Buildings, the Central Station Café, and the State fish shops, Valley and Victoria Bridge. Under this system, overhead charges are reduced to a minimum, and agents and retailers' profits eliminated. The consumer buys cheap fruit and the grower receives a fair return for his labour. Every possible care is taken to ensure the fruit arriving in a satisfactory condition. Only choice pines are marketed; cases are packed with straw to prevent bruising, and recipes for wine and jam making are enclosed in each case.

The mail order branch is already in full swing, orders coming from such distant places as Mount Morgan, Blair Athol, and Cunnamulla. The Glass House Mountains growers are appealing to the community generally for assistance in winning a livelihood on the land. Business men, employers of labour, and departmental heads can help by bringing the matter before the notice of their employees.

Direct Distribution.

In connection with the Glass House Mountains soldier growers' scheme of direct distribution from grower to consumer, the Trade Commissioner (Mr. W. H. Austin) advises that so far the response from the country has been very satisfactory. Quite a large number of other producers have decided to assist these growers and are making regular weekly purchases of pineapples while the crop lasts. Fruit also is going forward to the Mount Morgan miners and to the men on the Mundubbera railway extension. At the Ipswich workshops the employees have responded nobly. In the first week six cases were sent up to Ipswich on trial, the second week 30 cases were ordered, the third week 60 cases, and for the fourth week 120 cases were ordered.

Nodules in Beef—Successful Experiment.

Trial shipments of frozen beef under the new method of dealing with nodules, sent to London last year by Messrs. Borthwick and Co., and the Australian Meat Export Co., are the subject of a report dated 22nd December last, which the Premier (Hon. E. G. Theodore) has received from the Agent-General in London (Hon. J. A. Fihelly).

The report is prefaced by the following cablegram which Mr. Fihelly sent to Mr. Theodore on 20th December last: "Borthwicks and American companies' trial shipments under new method dealing with nodule most successful. Carcasses show great improvements and quite attractive. Port of London health authorities inspected this morning and seem favourable. Will cable their decision later when report to hand."

"It has long been recognised," states Mr. Fihelly, "that the disfigurement to hindquarters of Queensland beef caused by the search for and removal of nodules has affected their sale to some extent. Considerable interest was therefore evinced by the meat trade here in some shipments recently made by Borthwicks and Swifts of hinds dressed in such a manner as to cover the effects of the operation referred to. This has been done by lifting the skin from the portion affected before the meat was cut and carefully replacing it after the nodules had been removed. By this method the general appearance of the meat is undoubtedly rendered much more attractive, and the only thing to be considered now in connection with the experiment is whether the health authorities at the various ports have any objection to it.

"With the view of testing this point, shipments of 100 hinds have been made by Borthwicks to London, Liverpool, and Hull. The London consignment was unloaded from the Moreton Bay on the 19th instant, and on the 20th a number of the carcasses

were displayed by Messrs. Borthwick on their stall at the Central Meat Market, when, in addition to representatives of the meat trade and myself, the principal medical officer and other medical officers of health for the Port of London were invited to inspect them.

"The meat people were generally favourably impressed, and so far as could be gathered, the medical men approved of the arrangement provided that adequate guarantees are forthcoming that the work of removing the nodules is carried out as efficiently as heretofore. They have not yet, however, given their official decision in the matter, and it is possible that this may be withheld until the views of the medical officers of health at Liverpool and Hull have been obtained as a result of their inspection of the consignments above referred to made to their respective ports."

Pear Poison—State Arsenic Supplies.

In the course of a recent Press interview, the Minister for Mines (Hon. A. J. Jones) recalled that the mine and treatment works were established about five years ago for the express purpose of providing the shire councils and landholders who had prickly-pear on their holdings with arsenic for pear eradication at a low price. Immediately the Mines Department was ready to supply, the Cabinet decided to sell arsenic for pear destruction purposes at £10 per ton delivered at the nearest railway station. At that time the market price ruling was from £70 to £90 per ton. The Lands Department paid the Mines Department the difference between the cost of production and the £10 per ton, therefore the concession to farmers rightly belonged to the Lands Department. "It must be remembered," he added, "that the prickly-pear pest is a legacy handed down to this Government, and its destruction has now become a national question. At the same time, I am satisfied that the statement that pear is spreading at the rate of 1,000,000 acres a year is an exaggeration. However, it needs attention, and the Government recognises its obligation; the mine and arsenic works was established and is now the basis of pear destruction in the State."

"Hundreds of tons of State arsenic have been put into pear poison and sold direct at the cheap rate mentioned," Mr. Jones said, "and as a ton of arsenic kills many acres of growth, the State arsenic mine has contributed largely towards pear eradication, and has done much to keep it in check. However, the arsenic supplied at the absurdly low price of £10 per ton has not accomplished as much as I expected, for the reason that, arsenic not being soluble in water, the poison has to be mixed with other ingredients, and to give the best results the solution must be of certain strength—not too strong nor too weak. Its application to the pear is almost scientific and requires experience. Only recently one of our purchasers of arsenic at £10 per ton condemned the product of the State, although it was accompanied by a certificate from the Government analyst, and he paid £2 2s. for an analysis from the agricultural chemist, with the result that he had 96 per cent. grade. The difficulty was that he did not understand the mixing, which really is a scientific problem, and, in my opinion, for various reasons should not be left in the hands of the farmers. What is wanted is the supply direct to the farmers of a concentrated preparation in a powdered form of the poison which can be mixed with water.

"At present," Mr. Jones continued, "the manufacturers of arsenious pear poison place it on the market in liquid form, which again has to be mixed with water on the farm, and the price the farmer has to pay is out of all proportion to the value he receives. For instance, one line which is sold at 3s. 6d. per gallon contains less than 6d. in value, including the arsenic. We could manufacture this formula and place it profitably with the user at 1s. 3d. per gallon, allowing £50 per ton for the arsenic. The advantage of a concentrated poison in powdered form is in mixing, cost of transit by rail and cost of packing, and moreover it is less dangerous.

"The State mine at Jibbinbar is capable of producing all the arsenic used at present in Australia, although it is being brought into use recently for new purposes. Recently we supplied the South Australian Government with 62 tons of arsenic, which is used on their railway lines to check the growth of weeds and grass. The Queensland Railway Department is also supplied by us for that purpose. Although we have not refused an order during last year for pear destruction, by the end of the year we had accumulated 200 tons of arsenic. That has since been sold, chiefly in the South, and some for export to America, where there is a demand at present. To-day our orders exceed the quantity produced, but the orders received are mostly for export purposes, and we only sell our surplus after supplying the needs of the prickly-pear farmers and the manufacturers in our own

State. Arsenical poison is the most economical method of eradicating prickly pear at the present time, and while much is to be hoped for from the research work of Professor Johnstone and others for a parasitical remedy, yet during the progress of this good work the pear is growing and spreading over many miles of good land adjacent to our railways, which, if cleared, would be producing and contributing revenue to the Railway Department. The State arsenic mine is the basis of pear destruction in this State."

Silage Stacking.

Advice and instruction respecting the making and stacking of silage is being given in the country by expert officers of the Department of Agriculture and Stock. At present Mr. C. S. Clydesdale (Assistant Instructor in Agriculture) is visiting the Canungra area, where he is giving demonstrations. Mr. S. M. Smith (field assistant) is in the Boonah district, where he is giving information relative to the stacking of maize and other material for silage purposes.

PLATE 56.—A STRIKING FEATURE OF THE RECENT SUCCESSFUL CHEESE "DRIVE."
A Queen-street Window Display.

Cotton Pests.

Referring to cotton pests, Mr. Atkins, the expert attached to the Cotton Growing Association, said that a representative of a firm carried out a liquid spray test under the auspices of the association. The solution used was thoroughly effective in killing the smaller grubs on contact without injuring the plant. Although the cost of treatment is fairly low, the association is not yet satisfied that the results will justify the labour involved in spraying. In a few days it is hoped to place on the market some kind of smoke balls, which will enable a field to be thoroughly fumigated by a sulphurous smoke cloud, which would rid it of all insect life at a very low cost. The grub seems to be identical with those found on other crops in the days before cotton was introduced, and it is possible an increase in their numbers has been brought about as a result of the drought-resisting properties of the cotton crop, combined with the dry season. There seems to be a noticeable decrease in the amount of damage which has been done during the past few days. Reports from the Dawson Valley point out that the damage being done by pests is now on the wane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1923 AND 1922 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1923.	Jan., 1922.		Jan.	No. of Years' Records.	Jan., 1923	Jan., 1922.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	12·20	21	6·99	8·27					
Cairns	16·95	40	3·81	6·05	Nambour	9·46	26	5 99	4·39
Cardwell	17·21	50	4·31	3·92	Nanango	4·55	40	3·38	3·22
Cooktown	15·16	46	7·46	8·08	Rockhampton ...	9·12	35	5·49	4·36
Herberton	9·74	35	5·35	6·86	Woodford	7·47	35	4·31	3·49
Ingham	16·73	30	6·46	3·15					
Innisfail	20·95	41	11·37	6·03					
Mossman	18·37	14	7·61	9·25	*Darling Downs.*				
Townsville	11·78	51	1·14	5·23					
					Dalby	3·32	52	3·37	3·09
Central Coast.					Emu Vale	3·13	26	3·15	1·24
					Jimbour	3·78	34	1·18	1·48
Ayr	12·25	35	0·32	6·55	Miles	3·88	37	2·48	2·77
Bowen	10·48	51	0·91	5·12	Stanthorpe ...	3·55	49	2·80	1·20
Charters Towers ...	5·86	40	6·28	2·26	Toowoomba ...	4·95	50	2·91	2·28
Mackay	15·33	51	8·65	4·78	Warwick	3·51	57	3·29	1·29
Proserpine	18·22	19	4·26	3·12					
St. Lawrence ...	10·19	51	6·22	2·05	*Maranoa.*				
South Coast.					Roma	3·40	48	2·28	3·59
Biggenden	5·46	23	5·59	4·04					
Bundaberg	9·21	39	8·22	7·54	*State Farms, &c.*				
Brisbane	6·37	72	2·79	3·62					
Childers	7·94	27	4·44	6·13	Bungeworgorai ...	2·20	8	2·33	2·41
Crohamhurst ...	12·56	30	4·56	7·26	Gatton College ...	4·28	23	2·39	2·39
Esk	5·61	35	1·95	2·88	Gindie	4·00	23	1·85	3·91
Gayndah	4·83	51	3·56	2·13	Hermitage ...	2·90	16	3·28	1·40
Gympie	6·80	52	5·70	2·88	Kairi	8·35	8	4·65	...
Glasshouse Mts. ...	9·12	14	3·30	4·67	Sugar Experiment				
Kilkivan	5·79	43	2·64	1·14	Station, Mackay	16·96	25	5·95	3·71
Maryborough ...	7·43	51	5·17	3·14	Warren	6·89	8	3·59	2·44

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January, 1923, and for the same period of 1922, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
State Meteorologist.

Orchard Notes for April.

THE COAST DISTRICTS.

In the orchard notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed, that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus becomes toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruitflies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way shoud be rejected, as it is not to fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruitflies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newy cleared land time to sweeten before planting.

Strawberries can still be planted, and the earlier plantings must be kept well worked and free from all weeds in order to get a good crop of early fruit.

Scrub land intended for bananas can be felled now, as there will be little more growth, and it will have ample time to dry off properly in time for an early spring burn. Do not rush scrub falling, as it is work that pays for extra care. Lopping will improve prospects of successful fire.

Keep a keen lookout for fruitflies, and on no account allow any fallen fruit of any kind to lie about on the ground unless you are looking for trouble with the ripening citrus crop. Keep the fly in check, and there will not be any very serious losses; neglect it, and there will not be much fruit to market.

The advice given with respect to the handling and marketing of citrus fruit applies equally to custard apples, pineapples, bananas, and other fruits. In the case of bananas handled by the Southern Queensland Fruitgrowers' Association, Limited, grading is now compulsory, and it will undoubtedly tend to stabilise the market for this fruit.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Practically the whole of the fruit crop will have been gathered by the end of March, but several of the later-ripening varieties of apples grown in the Granite Belt may be kept for a considerable time, provided they are free from fly or other pests and are stored under proper conditions. Varieties such as Jonathan can be kept for some months at a temperature of 31 to 32 deg., and later varieties, such as Granny Smith and Sturmer can be kept till apples come again if stored at the same temperature. At the same time, although storing the fruit at this temperature under artificial conditions enables them to be kept for many months, the fruit can be kept for a considerable period, and marketed from time to time as desired, by storing it in a specially constructed apple-house in or adjacent to the orchard where grown.

Such a store can be cheaply constructed in the side of a hill out of the soil of the district and slabs of timber. The soil will make excellent pisé for walls, and the roof may be constructed of slabs covered with soil. Such a store can be kept at a very even temperature, and if the air is changed during cool nights—not frosty nights—the temperature can be reduced to a low point—low enough to keep the fruit in good condition for many weeks.

All orchards and vineyards not already cleaned up must be put in order, and all weeds destroyed. Keep the surface of the soil stirred so as to give birds and insects a chance to get at any fruitfly pupæ, as it is necessary to destroy this pest whenever there is a chance of doing so.

Land intended for planting during the coming season should be got ready in order to expose the soil to the cold of winter, thus rendering it sweeter and more friable.

If there is any slack time in the course of the month, go over all surface and cut-off drains and put them in good order. Also, if during periods of heavy rain, soft or boggy spots have made their appearance in the orchard, do what draining is necessary, as badly drained land is not profitable orchard land, and the sooner it is drained the better for the trees growing upon it. Soft or boggy spots are frequently caused by seepage of water from a higher level. In this case a cut-off drain will be all that is necessary, but where the bad drainage is due to hard pan or an impervious subsoil, then underground drains must be put in. After draining, the land should be limed. Liming can be done now and during the following three months, as autumn and winter are the best times to apply this material.

When the orchard soil is deficient in organic matter (humus) and nitrogen, try the effect of green-crop manuring, planting the grey or partridge pea and manuring the ground for this crop with a good dressing of finely ground island phosphate or basic phosphate.

Where citrus fruits are grown, they should now be ready for marketing. If the land needs it, it should be given an irrigation, but unless the trees are suffering from want of water it is better to stick to the use of the cultivator, as too much water injures the keeping and carrying qualities of the fruit.

The remarks on the handling and packing of citrus fruits in the coast districts apply to the inland districts also, but these districts have an advantage over the coast in that, owing to the drier atmosphere, the skin of the fruit is tougher and thinner and in consequence the fruit carries better.

Farm and Garden Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April:—Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922. Journal.

In those areas where seasonable rainfall permitted the planting of potatoes, these should now be showing good growth and must be kept free from all weed growths by means of the scuffle. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and, where necessary, thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat, *i.e.*, those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally, except cucumbers, marrows, and pumpkins. In connection with these crops, growers are recommended to adopt some form of seed selection for the purpose of improving the quality of vegetables grown by them. Just at present, selections should be made from all members of the cucurbitaceæ (pumpkins, cucumbers, &c.). Tomatoes should also be selected for seed. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1923.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·1	6·49	5·25	6·46	5·45	6·24
2	5·2	6·50	5·26	6·46	5·46	6·23
3	5·3	6·50	5·27	6·45	5·47	6·22
4	5·3	6·50	5·28	6·44	5·47	6·21
5	5·4	6·50	5·29	6·43	5·48	6·20
6	5·5	6·51	5·30	6·43	5·48	6·19
7	5·5	6·51	5·30	6·42	5·49	6·17
8	5·6	6·51	5·31	6·41	5·49	6·16
9	5·6	6·51	5·32	6·40	5·50	6·15
10	5·7	6·51	5·33	6·39	5·50	6·14
11	5·8	6·51	5·33	6·39	5·51	6·13
12	5·9	6·51	5·34	6·38	5·51	6·12
13	5·10	6·51	5·35	6·38	5·52	6·11
14	5·11	6·51	5·36	6·37	5·53	6·10
15	5·12	6·51	5·36	6·36	5·54	6·9
16	5·12	6·51	5·37	6·35	5·54	6·7
17	5·13	6·51	5·38	6·35	5·55	6·6
18	5·14	6·50	5·38	6·34	5·56	6·5
19	5·15	6·50	5·39	6·33	5·56	6·4
20	5·16	6·50	5·40	6·32	5·57	6·3
21	5·16	6·50	5·40	6·32	5·57	6·2
22	5·17	6·50	5·41	6·31	5·58	6·0
23	5·18	6·49	5·41	6·30	5·58	5·59
24	5·19	6·49	5·42	6·29	5·59	5·58
25	5·20	6·49	5·42	6·28	5·59	5·57
26	5·20	6·48	5·43	6·27	6·0	5·56
27	5·21	6·48	5·44	6·26	6·0	5·55
28	5·22	6·47	5·45	6·25	6·1	5·53
29	5·23	6·47	...	...	6·1	5·52
30	5·24	6·46	...	...	6·2	5·51
31	5·25	6·46	...	...	6·2	5·50

PHASES OF THE MOON, ECLIPSES, OCCULTATIONS, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer" Time is not used.

3 Jan.	○	Full Moon	12 33 p.m.
10 „	☽	Last Quarter	10 55 a.m.
17 „	●	New Moon	12 41 p.m.
25 „	☾	First Quarter	1 59 p.m.

Perigee on 8th at 9.54 p.m.
Apogee on 23rd at 11.24 p.m.

On 3rd January at 9 a.m. the Earth will be in perihelion, its least distance from the Sun about 91,300,000 miles. Three days later Venus will be in perihelion, and will be about 17,000,000 miles further from the Earth than it was on 25th November when in perigee.

On 29th January Mercury will be passing to the west of the Sun about 4 degrees on its northern side.

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2 Feb.	○	Full Moon	1 53 a.m.
8 „	☽	Last Quarter	7 16 p.m.
16 „	●	New Moon	5 7 a.m.
24 „	☾	First Quarter	10 6 a.m.

Perigee on 4th at 5.18 p.m.
Apogee on 20th at 6.18 p.m.

On 4th February Venus, apparently on the western border of Sagittarius, will be at its greatest western elongation, about 47 degrees from the Sun. On the 6th, soon after sunset, Saturn will be occulted by the Moon when below the horizon, but about four hours later the Moon, Saturn, and Spica will be apparently near to one another low down in the east.

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3 Mar.	○	Full Moon	1 24 p.m.
10 „	☽	Last Quarter	4 31 a.m.
17 „	●	New Moon	10 51 p.m
26 „	☾	First Quarter	2 42 a m.

Perigee on 4th at 8.48 p.m.
Apogee on 20th at 6.24 a.m.

The Moon will be partly eclipsed on the afternoon of 3rd March, and there will be an annular eclipse of the Sun on the 17th, but neither will be visible in Australia.

Saturn will be occulted by the Moon about 2 a.m. on 6th March, when apparently near to the bright star Spica in the constellation Virgo. This fine combination of celestial objects will be then high up in the sky, nearly overhead.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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